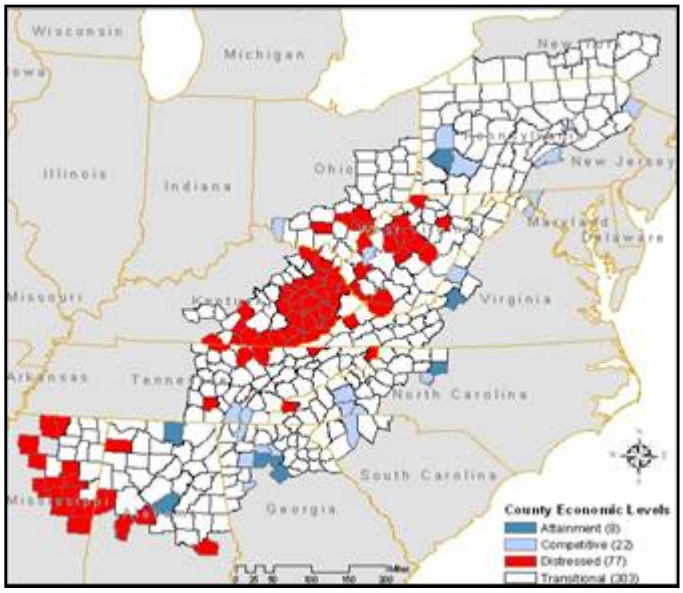
Sources of Regional Growth in Non-Metro Appalachia

Vol. 1. Project Background and Prior Research on Economic Growth Paths



Prepared for the Appalachian Regional Commission

Prepared by:
Economic Development Research Group, Inc.
Regional Technology Strategies, Inc.
MIT Dept. of Urban Studies & Planning

Revised 2007

SOURCES OF GROWTH PROJECT

The *Sources of Growth* project is part of a series of research efforts funded by the Appalachian Regional Commission to improve our understanding of factors affecting economic growth in rural and distressed areas. As stated in the Volume 1 Introduction, "the starting premise of this project is that there can multiple paths that an area can pursue in successfully enhancing job and income creation. They may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. The resulting direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development." This research is intended to provide a basis of information that can ultimately be useful for enhancing the effectiveness of policies and tools aimed at improving the region's economic development.

Results of the Sources of Growth project are presented in a series of documents listed below. This document is Volume 1.

- ***Executive Summary*** –synthesis of findings from all work products related to the study's four main research components.

- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties, classification of economic development growth paths, and synopsis of white paper findings on theory relating to economic development growth paths.

- ***Volume 2, Case Studies of Local Economic Development Growth Processes*** – findings related to growth paths as observed for selected case studies covering manufacturing industry specialization clusters, supply chain-based development, tourism-based development, advanced technology development, and diversification from resource-based economies.

- ***Volume 3, Statistical Studies of Spatial Economic Relationships*** – findings from a series of econometric modeling and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.

- ***Volume 4, Tools for Economic Development & Study Conclusions*** – description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** – (A) Spatial Analysis of Economic Health, (B) Economic Analysis of Hub-Spoke Relationships, (C) White Papers on Economic Growth Theories, (D) Literature Review of Empirical Studies on Spatial Influences in Economic Development

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

The Sources of Growth project involved a team of researchers including:

- Economic Development Research Group, Inc. (EDRG) – Lisa Petraglia (Project Director), Glen Weisbrod and Teresa Lynch, with research support from Tyler Comings and Brett Piercy;

- Regional Technology Strategies, Inc. (RTS) –Stuart Rosenfeld, Phil Psilos and Dan Broun.

- Massachusetts Institute of Technology, Department of Urban Studies & Planning (MIT-DUSP) – Prof. Karen R. Polenske, Prof. Joseph Ferreira, Jr. and Ayman Ismail, with research support from Tan Zhijun, Isabelle Xin Li, Yi Xu and Leigh Graham.

The project also benefited from the expertise of outside policy and research experts who reviewed various project documents, participated in meetings and provided technical guidance: Deb Markley (Co-Director of the Center for Rural Entrepreneurship, a Rural Policy Research Institute), Joseph Cortwright (Vice-President of Impresa Consulting), Ken Poole (Executive Director of ACCRA: The Council for Community and Economic Research), David Freshwater (Professor of Agricultural Economics and Public Policy at the University of Kentucky), David McGranahan and Luc Anselin (Professor. Dept. of Agriculture & Consumer Affairs and Regional Economics Applications Laboratory at the University of Illinois, Urbana- Champaign).

Overall project direction and oversight was provided by Dr. Greg Bischak of the Appalachian Regional Commission, whose wide range of research experience served to focus the project team on the development of policy applications. Important insight and suggestions were also provided by officials of the Appalachian Regional Commission who participated in a day-long symposium with the project team, including Thomas Hunter (executive director of ARC, Ann Pope (federal co-chair of ARC) and Rick Peltz (alternate federal co-chair). In addition, Ken Wester and Jason Wang of ARC assisted the project team in collecting and assembling transportation and geographic data.

Finally, the project team acknowledges the important role of prior ARC-funded research studies by Andrew Isserman, Ed Feser and Oleg Smirnov that provided a foundation for this project to build upon.

1 INTRODUCTION

1.1 Background and Objective

(A) Background: Growth Paths for Rural Economic Development

The Appalachian Region spans many diverse local economies (across 410 counties in 13 states), but is generally characterized by a greater degree of economic hardship and poverty than the nation as a whole. The Appalachian Regional Commission (ARC) was started specifically to help improve economic conditions in the region through a series of infrastructure and area development programs, accompanied by an active research program to help increase the effectiveness of those programs.

It has become clear that the most distressed economic conditions are generally occurring in the more isolated and rural parts of Appalachia, and that targeted efforts are needed to address those conditions. At the same time, it has also become clear that "in-vogue" economic development strategies, which often focus on seeking large-scale high-tech cluster development, are not necessarily appropriate or realistic for isolated, rural areas. Accordingly, the ARC embarked on a series of efforts to enhance our understanding of the alternative paths of growth that can be appropriate for rural areas, and ways that local development districts can move down those paths. The *Sources of Growth* project grew out of that effort.

The starting premise of this project is that there can multiple paths that an area can pursue in successfully enhancing job and income creation. They may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. The resulting direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development. For any specific area, though, some growth paths are much more likely to succeed than others. So successful economic development becomes a matter of first understanding the possible growth paths that may be relevant for a region, then assessing the best directions and pursuing the necessary steps to make them succeed.

(B) Objectives: Building on Prior Research

The *Sources of Growth* project emerged as a logical (and much needed) step from regional growth research – much of it ARC sponsored - to understand factors affecting economic growth, persistent distress, and implications for local policy initiatives in Appalachia's non-metro counties. It builds upon a program of prior ARC-funded research that has sought to explain why some parts of Appalachian have economically outperformed others and been more successful in moving out of economic distress, and what practically can be done to raise the economic well-being of communities long in need. Key prior ARC studies on these topics are listed in Exhibit 1-1 (table).

Exhibit 1-1. Prior ARC-Funded Studies Pertaining to Economic Growth Patterns

- *Amenities and Rural Appalachian Growth* (Deller, 2003)
- *An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia* (Smirnov and Smirnova, 2000)
- *An Assessment of Entrepreneurship in Local Appalachian Economies* (CFED, 1998)
- *An Assessment of Labor Force Participation Rates and Underemployment in Appalachia* (Keystone Research Center, 2001)
- *The Economic Effects of the Appalachian Regional Commission* (Isserman and Rephann, 1995)
- *Analysis of Business Formation, Survival and Attrition Rates of New and Existing Firms and Related Job Flows in Appalachia* (Brandow Co., 2001)
- *The Appalachian Economy, Establishment and Employment Dynamics 1982-1997: Evidence from the Longitudinal Business Database* (Foster, 2003)
- *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, Rosenfeld, 1997
- *Birth and death of Manufacturing Plants and Restructuring in Appalachia's Industrial Economy, 1963-1992*, Jensen, 1998
- *Regional Technology Assets and Opportunities: The Geographic Clustering of High-Tech Industry, Science and Innovation in Appalachia*, Feser and Goldstein, 2002
- *Core-Periphery Effects on Appalachian Regional Growth*, Moore, 1994
- *Trends in National and Regional Economic Distress, 1960-2000*, Wood, 2005
- *Building on Past Experiences: Creating a New Future for Distressed Counties*, Glasmeier and Fuellhart, 1999.
- *Branch Plants and Rural Development in the Age of Globalization*, Glasmeier et al, 1995

This new project has sought to address two limitations with existing research on sources of economic growth: (a) the literature features a multiplicity of theoretical approaches, with different perspectives for viewing the same growth phenomena; and (b) much of the current research is not accessible to practitioners, nor developed in ways that can directly help communities to pursue economic development.

Accordingly, this project has generated a series of reports collectively aimed at fulfilling three core objectives:

a) to span currently divergent lines of research on economic growth in order to build a broader understanding of factors that can facilitate economic development;

b) to advance the state of data analysis concerning how spatial location and access may affect the economic growth of ARC counties; and

c) to translate these activities into understandable findings and applications usable by practitioners.

1.2 Study Components and Team Roles

(A) Study Components

The Sources of Growth project involved four research undertakings:

(1) *thematic "white papers"* summarizing the distinguishing features of various economic development paths and the theories underlying them,

(2) *case studies* of economic development paths occurring in various non-metro areas in Appalachia,

(3) *statistical studies* of economic growth factors and the role of spatial relationships in Appalachia's non-metro counties,

(4) *enhancement of tools* for assessing local economic growth opportunities.

The white papers reviewed existing theories and literature in the fields of regional science and economics to describe the mechanisms that affect the nature of a local area economy and how further economic growth occurs. They examined the following forms of local and regional economic development: industry clusters, trade centers, supply chain and dispersal economies, resource-dependent, natural asset and learning-based economic development. They were also reviewed and discussed by an expert panel at a day-long symposium. This process provided an important foundation for identifying the different types of growth paths and the location factors determining their appropriateness for various areas.

The case studies used in-person interviews with local business and government

officials, together with data analysis of economic trends, to provide insight into how the various growth paths have actually taken hold for selected local areas. These case studies also provided a basis for assessing how hypotheses concerning the form and evolution of growth paths matched up (or in some cases, did not match) with actual experiences of those communities. This element of the project thus provided an important basis for refining our understanding of how location factors can enhance, constrain or redirect the direction and degree of economic growth success.

The statistical studies examined time-series data on changes in economic growth patterns and their relationship to spatial isolation, market access and transportation infrastructure. The reasons for this focus were: (1) recognition that while the various paths of economic growth served different markets, they all depended in some way on access; (2) that many of ARC's programs have aimed to reduce isolation and improve access, and (3) the availability of relatively new analytic methods for examining spatial relationships among counties.

The effort to enhance practical tools focused on upgrading the web-based Local Economic Assessment Package (LEAP) available for ARC's Local Development Districts and other economic development agencies to assess economic opportunities and targets for business growth and attraction. Based on findings from the other study elements, additional data sources and analysis measures were identified for evaluating the relevance of economic growth paths for local areas. Some of those additional elements have now been implemented, while others are still planned. .

(B) Study Team Process

Research Team. This research project was a joint effort of Economic Development Research Group, Inc. (EDRG), Regional Technology Strategies, Inc. (RTS) and the Department of Urban Studies & Planning at the Massachusetts Institute of Technology (MIT-DUSP).

- EDRG managed the overall project, organized the one-day symposium and expert panel review processes; developed three of the case studies, conducted time series analysis of access impacts on economic growth, developed a set of growth path indicators for the Local Economic Assessment Package, and authored the summary documents on overall study findings.

- RTS staff contributed to the classification of growth paths, developed a white paper on learning-based clusters, participated in the symposium and completed three of the case studies.

- MIT-DUSP provided the core literature review and data set assembly, developed white papers on trade centers and resource-based economies, participated in the symposium, conducted statistical analysis of economic "hub-spoke" relationships, and also conducted spatial correlation analysis of county-level economic growth outcomes.

Expert Panel for Research and Policy. An expert panel also contributed to the study by reviewing the white papers developed by project team members to summarize the state of theory and research on economic development strategies and growth paths. A One-day symposium was then held to discuss the content of the white papers, their policy implications, and the priorities for further research. The symposium was attended by the expert panel, officials of ARC and the project team. The goal was to refine our understanding of how various growth paths actually evolve and how they can be encouraged in non-metro parts of Appalachia. (A summary of findings on economic development theory from the white papers is included in this volume, and additional material from the white papers appears in a separate Appendix volume.) The expert panel was comprised of:

- Deb Markley - Co-Director of the Center for Rural Entrepreneurship, a Rural Policy Research Institute.
- Joseph Cortwright – Vice-President of Impresa Consulting and former chief economic development staff for the Oregon Legislature.
- Ken Poole - Executive Director of ACCRA: The Council for Community and Economic Research;
- David Freshwater –Professor of Agricultural Economics and Public Policy at the University of Kentucky; formerly Program Manager of TVA Rural Studies Program
- David McGranahan – Senior Economist at the US Dept of Agriculture's Economic Research Service, specializing in rural development.

Technical Modeling Expertise. Additional technical support for spatial modeling issues was provided by Luc Anselin, Professor Dept. of Agriculture & Consumer Affairs and Senior Research professor of the Regional Economics Applications Laboratory (REAL), University of Illinois, Urbana- Champaign. He provided advice on methods for investigating spatial influences on economic growth patterns, led a day-long seminar on *GeoDA* spatial analysis software, and provided comments on several elements of the MIT team's spatial analysis findings.

(C) Reports on Study Findings

Results of the *Sources of Growth* project are presented in a series of volumes:

- ***Executive Summary*** –synthesis of findings from all of the project's research components.
- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties,

classification of economic development growth paths, synopsis of white paper findings on theory relating to economic development growth paths, and empirical literature review on spatial growth modeling studies.

- ***Volume 2, Case Studies*** –findings related to growth paths as observed for selected case studies covering manufacturing industry specialization clusters, supply chain-based development, tourism-based development, advanced technology development, and diversification from resource-based economies.

- ***Volume 3, Spatial Analysis*** – findings from a series of econometric and statistical modeling studies and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.

- ***Volume 4, Tools for Economic Development*** – description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** – (A) Spatial Analysis of Economic Health, (B) Economic Analysis of Hub-Spoke Relationships, (C) White Papers on Economic Growth Theories

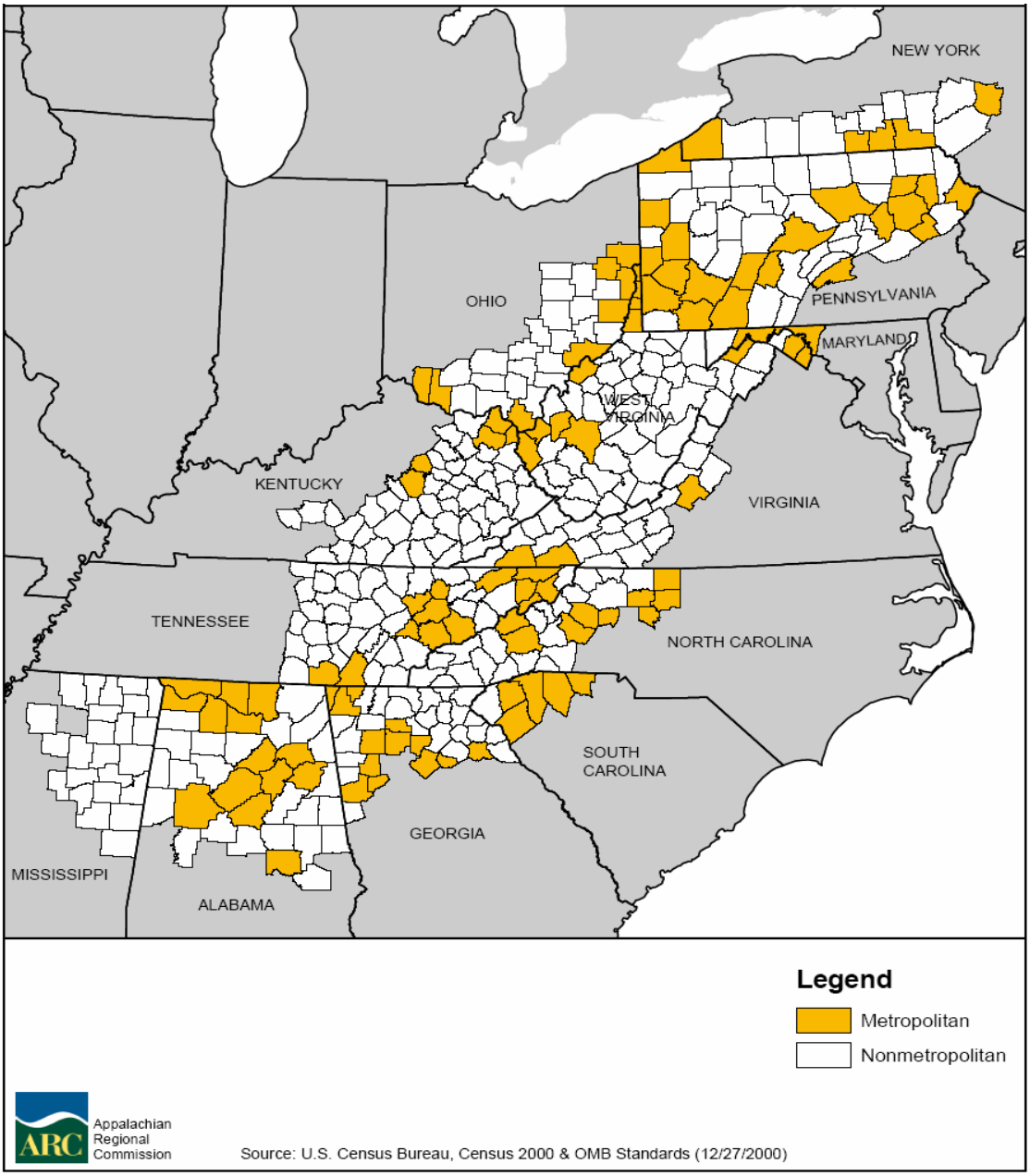
1.3 Classification of Appalachian Counties

The Appalachia Region is an area of 410 counties, spanning thirteen states. For purposes of this study, there are two key attributes that vary among the counties. They are: (1) level of urbanization and (2) level of economic distress. This study focuses on the economic development of non-metropolitan areas, which are the counties where the highest levels of economic distress have tended to occur.

(A) Categories of Urbanization

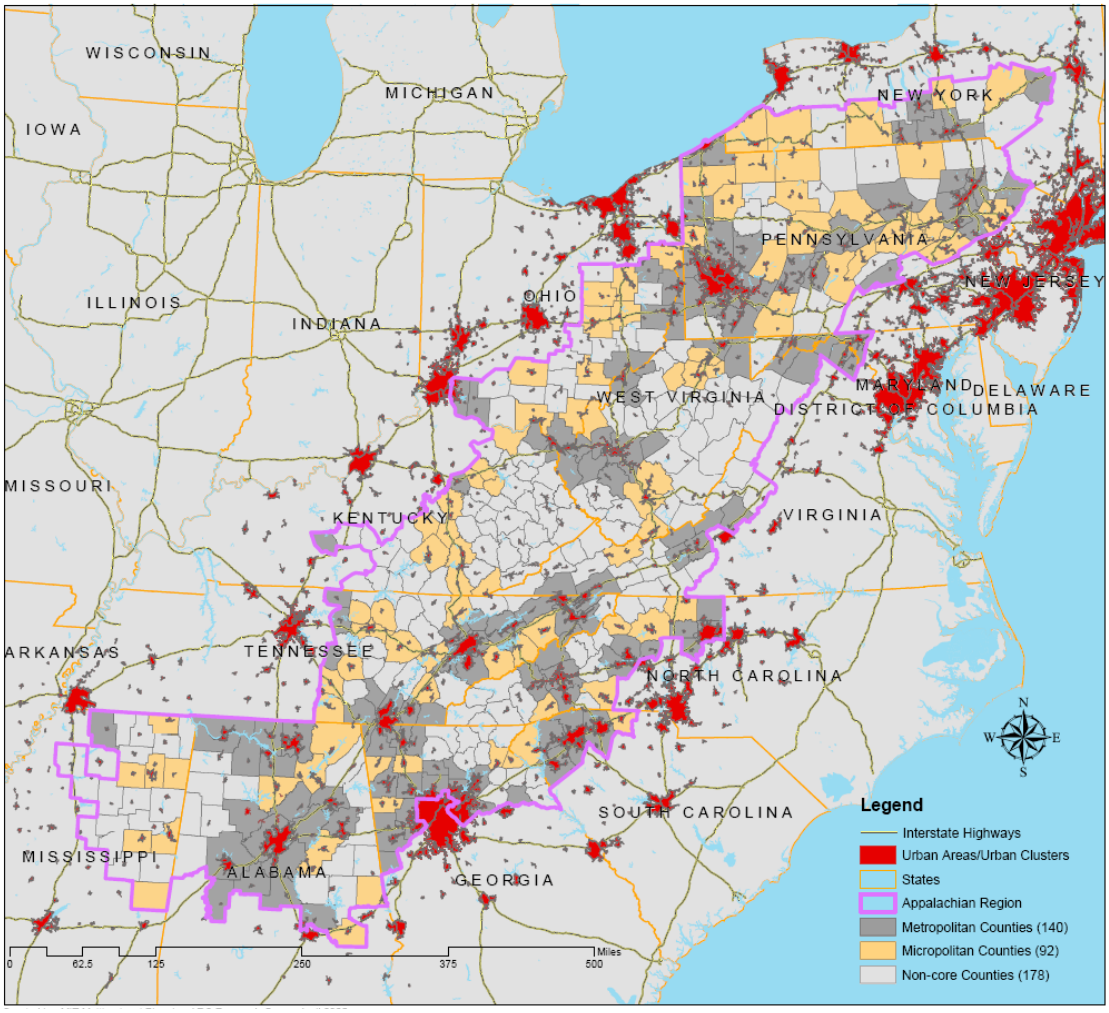
The level of urbanization is defined in terms of a distinction between metropolitan and non-metro areas. Exhibit 1-2 (map) shows the location of metropolitan and non-metro counties within Appalachia. A "metropolitan area" is defined as a county or set of counties with an urban cluster having a population of 50,000 or more in which at least 50% of the residents work also work in that area. The remaining counties are classified as "non-metro." Altogether, the Appalachian region has 140 metropolitan counties (with a total 2000 census population of 14.1 million) and 270 non-metro counties (with a total population of 8.7 million,).

Exhibit 1-2 Metro and Non-Metro Classification of Appalachian Counties



The 270 "non-metro" counties are further subdivided into 92 "micropolitan areas" (each having a total population base of 10,000 to 49,999 with at least 25% of the workers residing within that area) and 178 "non-core" counties (also more formally referred to as OBSA – "Outside of Core-Based Statistical Areas"). Exhibit 1-3 (map) shows the location of the micropolitan and non-core counties. Altogether, the Appalachian region has 92 micropolitan counties (with a total population of 4.9 million) and 178 non-core counties (with a total population of 3.8 million).

Exhibit 1-3: Micropolitan and Non-Core Classification of Appalachian Counties



Source: map generated by the MIT Multiregional Planning Research Group.
Data Sources: 2004 Urban Influence Codes, Economic Research Services, U.S. Department of Agriculture; 2000 Cartographic Boundary Files, U.S. Census Bureau; 2004 National Highway Planning Network, Federal Highway Administration, U.S. Department of Transportation.

(B) Categories of Economic Performance

The level of economic performance of Appalachian counties is classified as one of four categories: "distressed," "transitional," "competitive" and "attainment." Each year, the ARC updates its tracking of the economic performance of the region's counties. Using a recent three-year moving average on the unemployment rate, per-capita income levels and the Census poverty rate, thresholds are applied to create the four classes of economic performance. Exhibit 1-4 shows how the ARC economic performance categories are defined.

Exhibit 1-4. Criteria for County Economic Performance Levels, FY 2005

Economic Level	No. of Counties in Appalachia	2000-2002 Three-Year Average Unemployment Rate		2001 Per Capita "Market" Income		2000 Census Poverty Rate		
Distressed	82	7.3% or more [150% of U.S. 4.8%]	*and*	$17,627 or less [67% of U.S. $26,309]	*and*	18.6% or more [150% of U.S. 12.4%]	*OR*	twice U.S. poverty rate & qualify on one other indicator
Competitive	20	4.8% or less [100% of U.S.]	*and*	$21,047 - $26,308 [80% of U.S. = $20,541]	*and*	12.4% or less [100% of U.S.]		
Attainment	8	4.8% or less [100% of U.S.]	*and*	$26,309 or more [100% of U.S.]	*and*	12.4% or less [100% of U.S.]		
Transitional	300	All counties not in other classes. Individual indicators vary.						

Sources: U.S. Department of Labor - Bureau of Labor Statistics, Local Area Unemployment Statistics (LAUS), 2000-2002 (employment data); U.S. Department of Commerce - Bureau of Economic Analysis, Regional Economic Information System (REIS), 2001 (income data); U.S. Department of Commerce - Bureau of the Census, 2000 (poverty data).

Exhibit 1-5 shows how the relationship between level of urbanization and level of economic performance. It is notable that nearly all of the counties with an economic performance rating of "attainment" or "competitive" are within metropolitan areas. Conversely, most of the counties with an economic performance rating of "distressed" are (non-core) rural areas.

Exhibit 1-5. Relationship Between Urbanization and Economic Performance

	"Attainment" & "Competitive"		"Transitional"		"Distressed"		All of Appalachia	
Urban Influence Codes (2003)	**# of counties**	**Population (2000)**	**# of counties**	**Population (2000)**	**# of counties**	**Population (2000)**	**# of counties**	**Population (2000)**
Metropolitan	26	5,229,995	104	8,552,415	10	359,457	140	14,141,867
Micropolitan	3	120,353	69	4,152,993	20	640,796	92	4,914,142
Non-Core (rural)	1	18,324	86	1,965,980	91	1,785,929	178	3,770,233
Grand Total	30	5,368,672	259	14,671,388	121	2,786,182	410	22,826,242

Data source: Economic Research Services, U.S. Department of Agriculture, 2003.
http://www.ers.usda.gov/briefing/rurality/UrbanInf/

This project focuses specifically on the non-metro counties which account for nearly all of the under-performing areas. Exhibit 1-6 shows that distressed counties exist across all parts of Appalachia, though they are most strongly represented in the central part. Concerns have been raised in current regional growth research (Isserman 2005) that more important than a metro – non-metro county distinction would be classification distinguishing degrees of rurality at the sub-county level, since there are many cases of a county containing both a thriving urban area and poor rural communities. The USDA-ERS' *Beale Codes* offer further gradations on county classifications based on population densities and whether or not an adjacency to a metro area exists. Those more complicated codes are used in the empirical analysis parts of this project, as described later (refer to Volume 3).

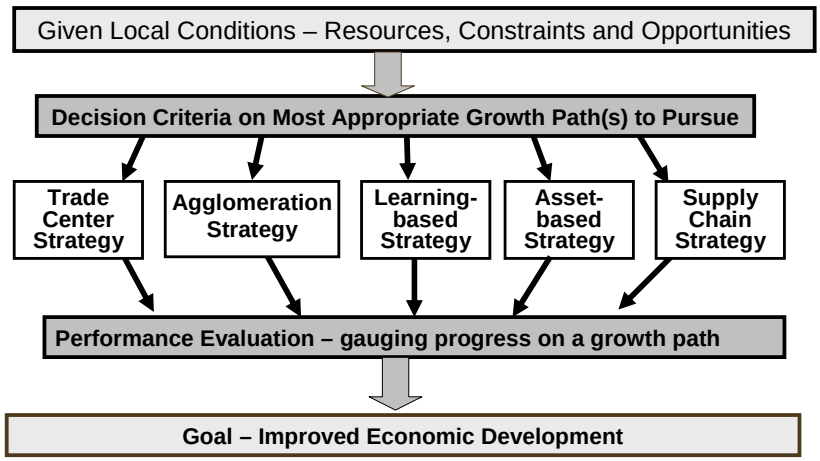
Exhibit 1.6 County Economic Performance Ratings by Geographic Region

		Appalachia's Major Region			
		North	**South**	**Central**	*Total*
# of Non-metro Appalachian Counties		91	102	77	270
arc status	*transitional*	74	83	36	*193*
	distressed	16	18	41	*75*
	competitive	1	1	0	*2*

1.4 Classification of Economic Growth Paths

Exhibit 1-7 (schematic) illustrates five basic types of growth paths, along with the process for initially assessing their appropriateness for a given area, and later evaluating program efforts to pursue them.

Exhibit 1-7. Types of Regional Growth Paths and their Use



This research study began with a general articulation of specific growth processes that have been emerging in the regional science literature and shown some success in the applied economic development field. The initial study phase focused on refining our understanding of the select set of growth theories and seeing how well each could be adapted to address rural locations such as Appalachia. A set of white papers was developed and became the basis for holding a one-day symposium in Washington DC, with comments led by an expert panel. A synopsis of the key conclusions from these white papers is presented in Chapter 2.

The specific economic growth paths examined included: trade center development, industry concentration clusters, dispersal economies (*e.g.* supply-chain development), resource-dependent growth, and asset-based growth (including both learning-based and natural amenity-based development). A brief description of each is provided in Exhibit 1-8 below. The theory behind these growth paths is discussed in the following chapter, and case study examples of them are provided in a separate report volume (refer to Volume 2).

Exhibit 1-8. Definition of Five Major Classes of Economic Growth Paths

Basis for County's Economy Growth	Description
Trade Center	Growth pattern emanating from a small urban cluster that provides goods and services to the exurban communities & rural hinterlands
Agglomeration (*e.g.* cluster economy)	Growth resulting from geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries.
Supply-Chain (*e.g.* dispersal economy)	Remote location is chosen over the central metropolitan area to host a node of economic activity (distribution or assembly) that is part of a larger (geographic) production chain.
Natural Amenity or Cultural Assets	Growth as a result of either quality-of-place attracting new households –or – efforts to actively develop & promote cultural, recreation, eco-tourism venues and their supporting visitor services. A variant exists based upon natural-resource assets that are tied to extractive activities such as mining, logging.
Knowledge (Learning) Assets	Growth opportunities leveraged from the collective knowledge embodied in the region, including social capital, technical applications / commercialization, institutional assets (educational and financial), entrepreneurial start-ups.

2 THEORY OF GROWTH PATHS

A series of white papers were developed that reviewed existing literature to inform our understanding of the various bases for economic growth, including *(a) trade centers, (b) industry concentration clusters, (c) supply chain and dispersal economies,* (d) *resource-dependent growth,* and (e) *asset-based growth*.

The white paper research process was designed to provide a better understanding of where and when a specific form of regional growth is most applicable and what characterizes such an economy; the potential to confuse/misidentify the economic growth process; whether multiple explanations of the growth process could represent an evolution of a region's economy; why there may be exceptions to what growth theory prescribes and most important the implications for development policy to achieve success along any of these paths. This chapter provides a synopsis of the key findings from these papers and the subsequent symposium discussion. The issues raised here provide a basis for identifying key aspects to be addressed in any economic development strategy that pursues a specific growth direction.

2.1 Economic Development Processes

(A) Role of Basic Industries. Underlying essentially all economic development strategies is the concept of developing business activity that can bring a flow of *spending into* the target region, which in turn can generate income and associated jobs. Economic-base theory classifies all economic activity as either "basic" or "non-basic" (Berry and Garrison 1958, Klosterman 1990, Blumenfeld 1955). A basic sector is composed of local businesses and firms that produce goods or services for "export" to customers located outside of the local area, which thus generates the flow of spending into the region. Products based on natural resources (e.g., mining, logging or tourism), learning-based resources (e.g., major educational institutions or cultural attractions) and manufacturing centers (e.g., furniture or computer products) tend to be basic industries because they usually export most of their products to outside customers in response to national or international demands. The non-basic sector is then comprised of firms that operate and produce primarily for local consumption. Analysts consider most local retail and personal services to be non-basic economic activities.

Using this classification, it then becomes clear that the means of strengthening and growing the local economy is to develop and enhance the basic sector. The basic

sector can be seen as the "engine" of a local economy, whereby development of firms that serve outside markets provides a basis for growing business investment and activity. Exports further fuel the economic growth of an area through "multiplier effects." Revenues from exports trickle through the local economies as payments to local factors of production, land, labor, and capital. These, in turn, generate an economic multiplier in the form of a chain-reaction effect. Local industries buy inputs from local suppliers, which then pay local employees and buy further inputs from local suppliers, etc. Local industries pay salary or wages to local employees, who then buy local products, further stimulating local businesses, who pay their local employees, and so on. These multiplier effects are important in triggering economic-growth, especially when the local economy is not developed enough to constitute a strong local demand; "priming the pump" in Keynesian terms (Berry and Garrison 1958, Klosterman 1990).

(B) Confusion about Clusters. Perhaps no single concept has propagated as much interest or confusion in the economic development field as the concept of cluster-based economic development. The concept of cluster-based development took off in the field of economic development following the work of Michael Porter (1990). He described the advantage of developing interconnected networks of businesses, suppliers, and associated institutions in ways that can increase productivity and create "Sustainable Competitive Advantage" (SCA).

However, in the sixteen years that followed, the meaning and interpretation of those concepts diverged between researchers and applied economic developers. Porter's original work never claimed that clusters were restricted to individual locations or individual industries. However, to many economic developers the concept became simplified down to the popular dictionary definition of the word "cluster," which implies a spatial concentration of a single item or type of activity in a single region. Going even further, some consultants further "dumbed down" the concept of cluster definition to economic base studies that simply generate a listing of the most prominent industries in a given study area. Those latter concepts are often of little use for achieving practical and effective economic development (Weisbrod and Piercy, 2006).

In fact, researchers have since clarified how the advantages of cluster dynamics can encompass concentrations of economic activity among places or industries or technologies or supply chains. This point is made clear in Exhibit 2-1, which shows Enright's (2001) twelve dimensions that can describe a competitive cluster. Following that research perspective, we can view clusters broadly, as concentrations of interrelated companies and institutions of sufficient scale to generate external economies. Their location may be concentrated in a single community, spread throughout a broad region, or aligned along a corridor stretching for hundreds of miles. However, in all cases, they include competing firms, cooperating material and service suppliers, and associated institutions – all of which may do business with each other and share needs for common talent, technology and infrastructure. This definition encompasses the range of potential growth models for Appalachia, though

the reader should be aware that arguments about and refinements to this definition are many.

Exhibit 2-1 Twelve Factors Describing a Competitive Cluster

Dimension	**Types**
Geographic scope	Localized, Dispersed
Density *(Number of firms)*	Dense, Sparse
Breadth *(horizontally related industries)*	Broad, Narrow
Activity Base *(activities in the value-added chain)*	Activity-Rich, Activity-Poor
Depth *(Range of vertically-related industries)*	Deep, Shallow
Geographic Span of Sales	Local, Regional, National, Global
Strength of Competitive Position	Leading in Region, Nation, World
Stage of Development	Embryonic, Emerging, Mature
Technological Activities	Users, Adapters, Generators
Innovative Capacity *(Ability to generate key innovation relevant to competitive advantage*)	High Innovation, Low Innovation
Ownership Structure	Local, National, Foreign
Industrial Organization *(Governance structures and relationships among firms)*	"All Ring - No Core", "All Core - No Ring", "Core-Ring with coordinating or leading firm
Co-Ordination Mechanisms *(Organization of inter-firm relationships)*	Spot markets, Short-term coalitions, Long-Term Relationships, Hierarchies

Source: Enright (2001)

Clusters are often, but need not necessarily be, defined around a specific industry sector, supplier-buyer network or industry supply chain. Some, such as semiconductors in Northern California, automobile manufacturing in and around Detroit, and furniture in Northeast Mississippi fit neatly within NAICS -based industry definitions. Other clusters are based on process technologies, such as the firms that produce plastic goods in the Naugatuck Valley of Connecticut. The largest users of plastics technology and skills, however, are Bic, Schick, and Lego, none of which is classified as a plastics company. Still other interdependencies that define clusters include supply chains, core technologies, proximity to natural resources, or distribution channels. Rocha (2002), in fact, outlines seven different intersections of geographical, industrial, inter-sectoral, and inter-organizational dimensions that have been used to create conceptual and operational definitions of clusters.

A correct representation of clusters thus starts with a portrayal of core industries, suppliers of capital goods, direct inputs, and specialized services, as well as private-sector economic activities that are "induced" by the presence of core industries. It may also include associations or supporting institutions specific to the cluster, skill and education providers such as universities and community and technical colleges that contribute to the territory's human capital stock, (and which may be public or private but are most frequently public institutions), and knowledge providers such as research institutions, technology diffusion organizations, and other providers of research and technology.

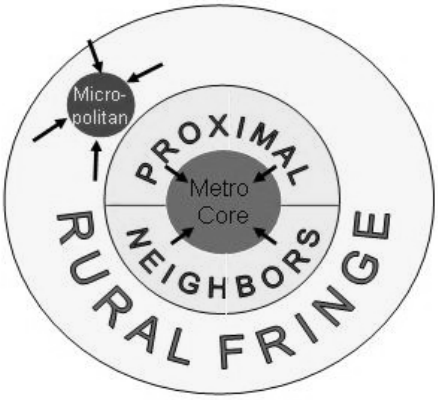
If we adopt this broad research-oriented concept of clusters, then it becomes clear that all of the growth paths examined in this study are variant forms of clusters. That includes trade centers, industry agglomerations, supply chains and dispersal economies, resource-dependent growth, and asset-based growth. However, if we adopt the more commonly used concept of clusters as viewed by practitioners, which defines clusters as the concentration of a single industry in a community or region, then only the "industry agglomerations" would be classified as traditional clusters. All other growth paths would then be classified as alternative economic growth strategies.

2.2 Trade Centers

Trade Center Economic Growth. A pattern of economic growth and development emanating from a small urban cluster that provides goods and services to the exurban communities & rural hinterlands. Spending money flows from the outlying region into the trade center.

(A) Overview of Trade Centers. A trade center can be defined as the urban nucleus (metropolitan or micropolitan) in a county or group of counties that plays a central role in the region's economy and economic-growth. It typically has a number of key ingredients, such as business and office space, a community college, retail outlet, and/or medical, business and personal services. A trade center can be the core of major metropolitan area, but it can also be a small town (of 10,000 or more population) that serves residents of a multi-county rural region. The core county is then classified as a micropolitan center. Trade center-based economic growth depends on the development of "hub-spoke" travel and trade patterns that connect the core community with the outlying region that it serves. (See schematic of metropolitan and micropolitan area relationships in Exhibit 2-2.)

Exhibit 2-2. Schematic of Spending Flows and Relative Locations of Micropolitan Areas in Non-Metro Rural Fringe



From an economic development policy viewpoint, the key questions are: (1) how do trade centers evolve over time as urban centers of retail trade and services for a surrounding hinterland, (2) what are the characteristics of a successful trade center, and (3) how can existing trade centers be leveraged as an agent for economic development. These questions are addressed through a discussion of the functional role of trade centers and a synthesis of theories drawn from the economic development and economic geography literature that help explain the role of trade centers as economic growth engines relevant in Appalachia.

(B) The Functional Role of Trade Centers. The functional role of a trade center can be best understood by answering the following questions: (1) what functionally makes a trade center, (2) what are the hierarchies of trade centers and their roles, and (3) what are the complementary roles of other adjacent, proximate or otherwise interacting activity centers.

The concept of trade centers is based on the highly simplified central-place model of Christaller and Lösch. The central-place model examines the interaction between a rural region that is dependant on activities requiring extensive land use, e.g., agriculture or mining, and an urban center that has significant economies of agglomeration, and is based on activities requiring higher density, e.g., trade or industry (Hoover 1997, Krugman 1995).

Urban geographers identified typical geometric patterns that describe the way trade centers form with respect to the surrounding rural regions. They also defined hierarchies of trade centers that range from small towns that serve a rural surrounding area, to a larger city that serves a group of small surrounding towns, and so on. These hierarchies are influenced by three basic factors: transportation costs, market density, and scale or agglomeration economies (Hoover 1975). Most of these factors are based on an agrarian or industrial economy where the economy's equilibrium is determined around the optimum physical delivery of goods from their origin to their final consumers. However, different patterns may evolve as a result of the current service economy, e.g., higher sprawl of urban activities. New factors may affect the evolution of trade centers, their distribution over space, and their functional role, e.g., the globalization of markets and the role of exports in economic development (see our later discussion of economic-base and import- substitution theories), and agglomeration and dispersion, including supply-chain theories.

Based on these theories, it can be suggested that a trade center performs a critical functional role to its rural surrounding area. Hoover (1975, p. 129) illustrates a hierarchy of services that are typically performed by trade centers depending on their size and position in the hierarchy, and ranging from the "convenience services" to the "primary wholesale-retail" services. This hierarchical model may be extrapolated to other types of services, e.g., financial services ranging from a small bank branch, to a full banking service; or to educational institutions ranging from a primary school to a large regional university with research capabilities. However, the distribution and hierarchy of trade centers may have evolved from the simple "transportation-

dependant" model that is based on proximity, to a more complicated model that incorporates the effects of services and technology (e.g., call centers scattered over space with no transportation cost and low investment requirements).

(C) The Multiplier Effect of Trade Centers. The current definition of metropolitan and micropolitan areas reflects their linkages with the adjacent areas in the form of labor commuting, commodity flows, and shopping and recreational activities. Each of these linkages has a "multiplier effect" on the adjacent regions. For example, labor commuting to/from these centers to adjacent areas has a multiplier effect on the economy of the counties where the workers live. The size of the multiplier effect varies depending on the size of a region's economy and the employment base, but analysts typically determine local multipliers of two or three (ERS 2005). Applying this multiplier of two or three to the 25 percent minimum-commuting requirement implies that 50 to 75 percent of the income in the adjacent counties where workers reside is connected to the central economy of the metropolitan or micropolitan area. This could be a direct relationship, through commuting to jobs located in the central county, or an indirect relationship, through services provided to local residents whose jobs are in the central county.

(D) Adjacency and the Urban Influence of Trade Centers. Geography matters in economic development. A county's geographic context has a significant effect on its economic growth and development through its size and access to larger economies. This access to larger economies, which represent the centers of trade, information, education, communication, labor, and finance, enables a smaller economy to connect to national and international marketplaces. Studies by Smirnov and Smirnova (2000) attempt to portray how areas can be classified as trade center "hubs" that export goods and services, and outlying areas that represent "spokes" importing goods and services from the hubs.

The measurement of adjacency and urban influence has also been developed by ERS using a set of county-level, urban-influence categories. The 2003 urban-influence codes divide the 3,141 US counties into 12 groups based on their urbanization (large/small metropolitan, micropolitan, or noncore) and adjacency to large/small metropolitan, micropolitan, or none (see Exhibit 2-4).

The urban influence codes define proximity based on physical adjacency. For example, there are 15 micropolitan areas that are adjacent to a large metropolitan area in Appalachia, with a total population of more than 1 million (~70 thousand inhabitants per town). Due to their location, it is likely that these trade centers' economies are linked with the larger adjacent metropolitan area. In using these trade centers as triggers for economic growth to their surroundings areas, we can emphasize their functional and economic relationship with the larger metropolitan city.

The urban influence codes also define 24 smaller micropolitan areas that are not adjacent to a large metropolitan area. They have a total population of ~ 900 thousand inhabitants (~37 thousand inhabitants per town). These trade centers are not connected

through geographic proximity to the larger metropolitan cities, and they may fall lower in the hierarchy. Analysts should consider other factors that may contribute to their connectedness when thinking of an economic-development strategy. For example, are these trade centers part of a supply chain? Are they nodes on a major transportation route (highway, airport or river)? Empirical studies described in the next chapter discuss how alternate measures of *proximity* may explain how different types of trade centers affect economic growth outcomes for Appalachia.

Exhibit 2-4. Urban Influence Codes

		United States			Appalachia		
	Description	**counties**	**Pop.** (million)	**Pop. density**	**counties**	**Pop.** (million)	**Pop. density**
	Metropolitan counties:						
1	In large metro area of 1+ million residents	413	149.2	558	34	5.2	293
2	In small metro area of less than 1 million residents	676	83.4	132	106	9.0	182
	Non-metropolitan counties:						
3	Micropolitan adjacent to large metro	92	5.1	55	15	1.1	114
4	Non-core adjacent to large metro	123	2.4	27	17	0.4	52
5	Micropolitan adjacent to small metro	301	14.7	51	53	2.9	95
6	Non-core adjacent to small metro with own town	358	7.9	23	41	1.2	54
7	Non-core adjacent to small metro no own town	185	1.9	6	36	0.6	38
8	Micropolitan not adjacent to a metro area	282	9.1	27	24	0.9	78
9	Non-core adjacent to micro with own town	201	3.2	17	30	0.7	49
10	Non-core adjacent to micro with no own town	198	1.3	7	24	0.3	32
11	Non-core not adjacent to metro/ micro with own town	138	2.2	5	8	0.3	62
12	Non-core not adjacent to metro/micro with no own town	174	1.0	4	22	0.3	35
	Total	3,141	281.4	80	410	22.8	114

Source: Economic Research Services, U.S. Department of Agriculture. All population figures from year 2000 Census. See http://www.ers.usda.gov/briefing/rurality/UrbanInf/. Calculations by MIT-DUSP.

(E) Trade Centers as a Basis for Broader Economic Development. Economic-base theory provides an explanation of the role of metropolitan and micropolitan trade centers in the development of adjacent areas. The linkages of small adjacent counties to a large metropolitan or micropolitan economy provide it with access to a large external market for product and service "exports" (sales beyond the trade center itself). This market could be the local market in this adjacent urban region, or a national or international export market that is accessed through the network of firms and businesses in this area. In effect, the metropolitan or micropolitan area becomes an "export" market, or a channel to a larger export market for the adjacent economy.

Similar to the role of export growth, the economic development strategy of "import-substitution" also emphasizes the role of trade centers in local economic-growth. With adjacency to a large metropolitan or micropolitan area acting as a trade center, local industry in a proximal county could experience growth through an import-substitution

role, by providing a market for growth of locally-based suppliers. A small rural county that is not adjacent to a trade center does not have the size or scale that allows for local entrepreneurs to create local industries that substitute for imports. Adjacency to a larger trade center is thus a necessary but not sufficient condition to trigger this process.

As trade centers ties together surrounding counties to comprise a larger market area, they can also provide a critical mass of labor force, training and/or commercial activity to make the area attractive for additional business activity. Building on the theories of "agglomeration" and "supply chains" (discussed later in this chapter), the trade center labor market can become a basis for directly growing industry clusters or growing suppliers to more distant industries. That can help explain the advantages of trade centers located in central places, along major transportation routes, or across industrial supply chains (physical or virtual).

These opportunities together make the issue of access a critical one in Appalachia. Given the geography of the region, many of the rural counties have no adjacent urban trade center (metropolitan or micropolitan center), nor do they have effective access to one via the transportation network. Those counties tend to be the distressed ones. An obvious cause of this disconnectedness is the mountainous topography of the region. For that reason, the development of enhanced highway links, such as the Appalachian Development Highway System (ADHS), can become important in enhancing connectedness to trade centers.

Case Studies. Examples of economic development based on trade centers are shown in Volume 2 focused on Pike County (KY) and Southwest North Carolina (Murphy). Measurement issues regarding the definition of a trade center are also discussed in the Volume 2 in the case examined for Scioto County (OH).

2.3 Industry Agglomeration (Clusters)

Industry Agglomeration-Based Growth – Economic growth resulting from geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries.

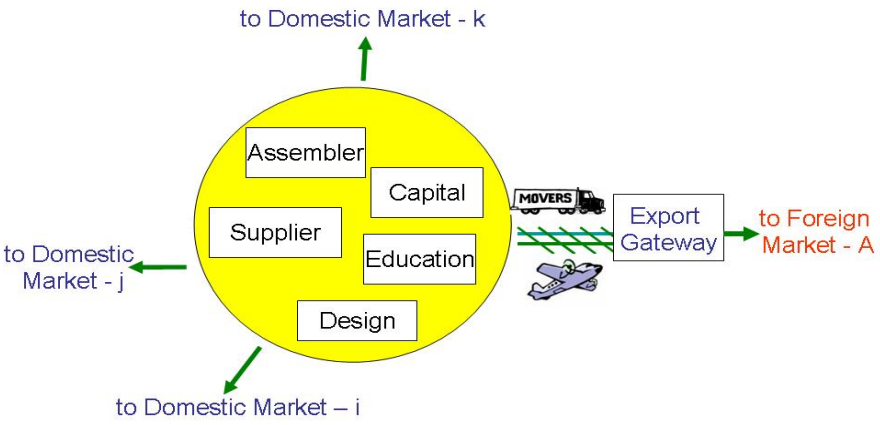
(A) Overview of Industry Clusters. An industry agglomeration cluster is a group of business enterprises and non-business organizations that benefit from belonging to the cluster by increasing their individual competitiveness. Binding the cluster together are "buyer-supplier relationships, or common technologies, common buyers or distribution channels, or common labor pools" (Enright 2001). Clusters are ultimately based on individual firm economic maximization functions. However, cluster analysts also recognize the role of trust and cooperation among cluster firms. They define non-business organizations as "related and supporting institutions," which are a critical

element in the success of the cluster. These organizations may include industry associations, universities, technical and community colleges with specialized industrial programs, economic-development agencies, or government industrial-extension programs. Regional industry clusters are industry clusters that are concentrated geographically, where geographic proximity between member enterprises creates a competitive advantage for the industry and region (Enright 1996).

(B) Functional Role of Industry Clusters. Michael Porter (1990), through his publication of *The Competitive Advantage of Nations*, revived policy interest in regional industry clusters as a source of national and regional competitive advantage. He identifies a key role for geographic proximity, which is largely consistent with the previous work by Isard (1956) on industrial-complex analyses. Porter's clusters are also similar to the constellations of suppliers, producers, and other economic actors suggested by Darwent (1969). Exhibit 2-5 illustrates this interplay design, assembly supply, and educational activities.

An even earlier antecedent is the work on agglomeration economics descending from Alfred Weber's (1909) classical location theory formulation, and those descending from Alfred Marshall's industrial districts formulation. These works have evolved into a more comprehensive theory of sectorally-based regional advantage through numerous iterations and refinements. The dual tenants that firms benefit from clustering with like firms, suppliers, and related institutions (1) through *agglomeration economies or external economies of scale that reduce production, transportation, and coordination costs*, and (2) through soft economies of *learning and collaboration that speed innovation and product and process advancement (*also *Collective Efficiency).*

Exhibit 2-5. Schematic of Agglomerated Economic Activities



(C) Basis for Development of Industry Clusters. The idea of why enterprises cluster in geographic space and how that influences regional economic-development finds its theoretical explanation in the literature in two basic theories, both of which cite externalities to explain why firms cluster:

- industrial location theory that builds on both Weber and Hoover, where the benefits are called agglomeration economies; and
- Marshall's analysis of external "economies of scale" (agglomeration benefits) and their presence in "industrial districts."

Finally, it can be argued that a metropolitan or micropolitan trade center may also help a competitive industry to emerge by benefiting from economies of scale and links to national and international supply chains. Some industries rely on an urban nucleus to provide the basic elements required for a cluster to emerge. Industry clusters need infrastructure that supports them (e.g., labor and transportation for a manufacturing industry, or research centers and universities for a hi-tech industry). They also need access to transportation, telecommunication, and other necessary infrastructure. All these elements need an existing trade center that could act as an incubator for this cluster. Therefore the existence of a trade center can be a starting basis for later emergence of industry clusters.

(D) Process Motivating Cluster Development. It is important to note that few (if any) clusters have been "created" through policy or program interventions. Cluster formation and growth has tended to be an organic process with varying degrees of influence of factors such as natural resource (raw material or energy supply) inputs, antecedent industries, "lead firms," either headquarters or branch plants, and local or regional craft or skill traditions. More recently, greater attention has been given to clusters that are created or enhanced by the residential location preferences of skilled professionals, creative and artistic communities, and entrepreneurs (Kotkin, 2000). Examples of "reasons" that have motivated firms to cluster appear in Exhibit 2-6.

Exhibit 2-6 Types and Examples of Cluster-Based Development

"Reason" For Cluster	Example Cluster(s)
Product	Hosiery, Catawba Valley, North Carolina
Process	Plastics, Naugatuck Valley, Connecticut
Industry Supply Chain	Auto suppliers, Central Kentucky
Company Supply Chain	Proctor & Gamble, Alexandria, Louisiana
Technologies	Optics & Imaging, Tucson, Arizona
Skills/talent	New Media, Manhattan
Resources	Log homes, Montana
Location/Infrastructure	Distribution: Hampton Roads, Virginia
Creativity	Writers, Livingston, Montana
Lifestyle	Software, Fairfield, Iowa

Firms may remain in a cluster long after the initial "reason" for choosing its location has become irrelevant, largely due to the development of one or another form of special expertise over time (Enright, 2001). As noted by Feser et.al. (2001), "in their ideal form, clusters are essentially the empirical manifestation of the mutually reinforcing influences of first-mover effects, conventional business agglomeration economies, localized technology spillovers, and geographical path dependence."

Numerous state and regional studies in the US have explored the "family trees" of clusters to identify the process by which they have evolved and grown. The number and scope of businesses in a cluster typically results from spinoffs and company formation subsequent to layoffs. These include efforts by the UC-Connect in San Diego, Maryland's TEDCO, and the National Commission on Entrepreneurship. In addition, the presence of a ready base of customers, suppliers, and knowledge also tends to coincide with an environment that exhibits a high degree of support for new entrepreneurs with a well facilitated entrepreneurial process which is a key component of cluster growth.

A concise summary of the types of benefits that firms access through operating in clustered configurations considers both the "hard" economies related to cost factors stemming from agglomeration efficiencies and "soft" economies that capture "higher order" dimensions related to learning and collective efficiency. (See Exhibit 2-7.)

Exhibit 2-7. Advantages of Industry Agglomeration Clustering

Type of Economies	Specific Factors Present	Benefits to Firms
"Hard" Economies *(Agglomeration)*	Supply Chains	Reduced transaction costs
	Labor Pools	Higher levels of experience
	Specialized Services	More options, lower costs
	R&D and Technology	Quicker adoption
	Capital	Increased availability
"Soft" Economies *(Collective Efficiency)*	Association	Collective influence
	Networking	Economies of scale, learning
	Tacit Learning	Innovation
	Knowledge Leaks	Imitation
	Labor Grapevines	Better employment opportunity

Of course, the line between these types of economies is somewhat fuzzy: specialized services may evolve due to the intentional or unintentional communication of multiple firms' service needs, and it is often difficult to separate cost reduction and innovation when assessing why firms adopt new technologies or processes.

(E) Implications for Policy in Appalachia. Industry agglomeration clusters in non-metropolitan areas (and less favored regions in general) face specific challenges on a number of the dimensions outlined above. It is well known that the nation's rural

manufacturing economy was largely seeded by branch plants seeking lower operating costs and contains many firms that suffer from isolation and less sophisticated management. When considered along Enright's descriptive dimensions rural clusters are challenged by their low density, less advanced technology activities, lower innovative capacity, and limited activity base. As noted by Rosenfeld (2001), the types of businesses that tend to clusters in less favored regions are inclined to rely more on cluster characteristics that reduce costs than on those that accelerate innovation and learning. The characteristics of many less-favored regions—low levels of educational attainment, weak schools, little investment capital, weak connections to external markets, and poor physical and support infrastructures—strongly favor those clusters that are low-tech, traditional industries, based more on imitation than innovation. Those clusters are very susceptible to global competition.

This appears to be particularly true in Appalachia. Bernard, et.al (2004), present six conclusions regarding Appalachian industries' vulnerability to imports. They cite (1) accelerating growth in trade with low-wage partners such as China and India, particularly in non-capital or technology intensive industries, (2) the associated high probability of plant closure, employment loss, and output reduction resulting from the arrival of low-wage imports for a given sector, (3) the concentration of Appalachian manufacturing employment and output in industries that are highly exposed to these imports resulting from the Appalachian industry's lower skill intensiveness and productivity, (4) an observed "more pronounced" impact of low-wage imports on shutdowns of Appalachian manufacturing plants than on plants in other US regions, (5) the forecasted rapid increase of low-wage imports in the coming decade, and finally, (6) low rates of entry and exit of Appalachian manufacturing industries indicating a tendency to be slow to adjust their product mix. (Bernard, et.al. 2004)

This phenomena is not unique to Appalachia or to non-metropolitan regions in the U.S. Nearly all of the industry agglomeration clusters that have been studied in less favored or less developed regions consist of companies that use low levels of technology and require skills that can be learned on the job, where barriers to and costs of entry are low, and that require little if any investment in research and development. An overview of the regions in the European Union categorized by its Social Fund as "less favored" characterizes them as having "sectoral specialization in traditional industries with little inclination for innovation and predominance of small family firms with weak links to external markets" (Landabaso, Oughton, and Morgan, 1999, Rosenfeld, 2001).

Yet, in recent years, accelerated globalization has combined with restructuring of global manufacturing firms to produce rapid job loss in the United States' manufacturing sector. The popular press attributes much of this phenomenon to China's current ascendance as an industrial power, as a consumer marketplace, and as a low cost production platform (Engardio, 2004). According to the US-China Economic and Security Commission's 2004 report, over 1.5 million jobs were shifted from the US to China in the 1989-2003 period.

For economic development professionals and researchers, the post-2001 period appears to be a "perfect storm" for the manufacturing sector. Several events have been at play: first, a jobless recovery from a brief recession of 2001-2002 has led US and global companies to restructure operations focused on cost saving and access to rapidly growing Asian markets (especially China); second, increased per-worker productivity stemming from automation and technology have reduced employment growth in many sectors; third, financial resources available among state and local governments to address industry competitiveness have been limited due to state budget shortfalls and other current federal spending priorities. Add to these factors two decades of trade liberalization which has hit some of the most vulnerable industries in the United States especially hard - furniture, textiles, and other traditional manufacturing sectors (all key employers in Appalachia) - when quota restrictions on imports have been lifted.

Case Studies. Examples of manufacturing and industry agglomeration clusters are shown in Volume 2 focused on Chautauqua County (NY) and Monongalia County (WV).

2.4 Supply-Chains and Dispersal Economies

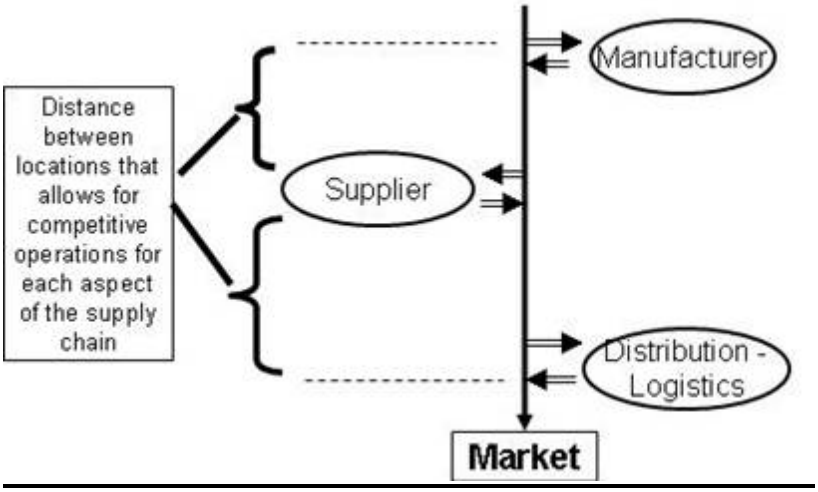
Supply Chain Development– Economic growth based on the development of businesses that are dispersed across a large distance but accessible to a single transportation corridor. This is typically a concentration of assembly, parts and distribution activities supporting a common set of industries. This arrangement takes advantage of "dispersal economies" that come from tapping different labor and material supplier markets, while serving a "just-in-time" supply chain made possible by transportation facilities.

(A) Overview of Supply Chain Basis for Economic Growth. A supply chain is the network of producers, retailers, distributors, transporters, storage facilities and suppliers that participate in the production, delivery, assembly, and sale of a particular product. The supply-chain concept has its theoretical foundation in two sets of literature. First, the early regional development literature on industrial development and infrastructure planning, which deals with how firms make decisions on locating their activities based on the economies or diseconomies of dispersal over the supply chain. The second set of literature is based on logistics and supply-chain management in operations research, management and civil engineering, which deals with the optimization of the time and cost of managing the supply chain (Polenske, 2001).

As supply transactions chains become more complex involving technological and logistical relationships between firms (e.g., firms connecting their inventory management systems, or firms creating long term preferred supplier networks), it

becomes important for a firm to be an integrated part of an established supply chain. Exhibit 2-8 illustrates the relationship between assembly, suppliers and distribution activities in a spatially-dispersed supply chain.

Exhibit 2-8 Schematic of Dispersed Supply Chain Linkages



(B) Dispersion of Business Location. Firms in different manufacturing sectors have different product characteristics, demand patterns, and require different service levels, so that they prefer different supply chains and logistic systems. Polenske (2003) developed the concept of "dispersion economies" to represent various cost and technology factors that are now causing some firms to move away (disperse) from concentrated centers of economic activity.

A considerable amount of this dispersal occurs along supply chains. Glasmeier and Kibler (1996) examine the dispersing trend of wholesale and distribution industries in the United States. They find that locations of wholesale establishments and warehouses have shifted from urban areas to rural and adjacent suburban areas largely due to the technological improvements in inventory management, warehouse structure, as well as transportation deregulation, all of which are critical components of supply-chain management. With dramatic advances in information technology, the expansion of globalization, and the decrease of transportation costs as a share in the total cost, some firms have larger scope and more flexibility in their supply-chain design.

In terms of structural approaches in supply chain management, cost reduction by moving to lower labor-cost regions often outstrips increased delivery costs if transportation costs and duties are low. Additionally, improvement of the coordination mechanism makes it possible for an industry or a firm to access more sophisticated products and services at a greater distance with higher quality than before (Flaherty 1996).

(C) Dispersal through Organizational Networks and Transportation Corridors.
Improved information flow and just-in-time transportation processes have facilitated industrial dispersal occur more rapidly than before. Teubal et al (1991) note that a network organization linking firms or economic agents represents an intermediate "system of governance" that lies between the firm and the market. Traditionally, there are different types of networks, including inter-firm networks, employment networks, social networks, and political networks. Analysts have viewed the scope of networks as extending from pure simple connections of similar characteristics to more complex relationships among all economic participants, including private firms, government agencies, universities, intermediary agencies, and communities (Harrison 1992).

Linkages among those economic actors can occur at various levels, from local retail districts, which stay close to urban residential communities, to specialized auto-parts towns that serve regional auto-manufacturing factories, and to research and development (R&D) institutions that disseminate their newly developed technologies at state and world levels. Therefore, depending on the growth potential of an industry, patterns of activities, innovative capacity, and governmental structure, multilevel networks (local, regional, national, and international) lead to various dispersion tendencies of economic activities. In this case, policy makers should take into consideration the impacts of other economic players on firms' location decision in addition to inter-firm networks.

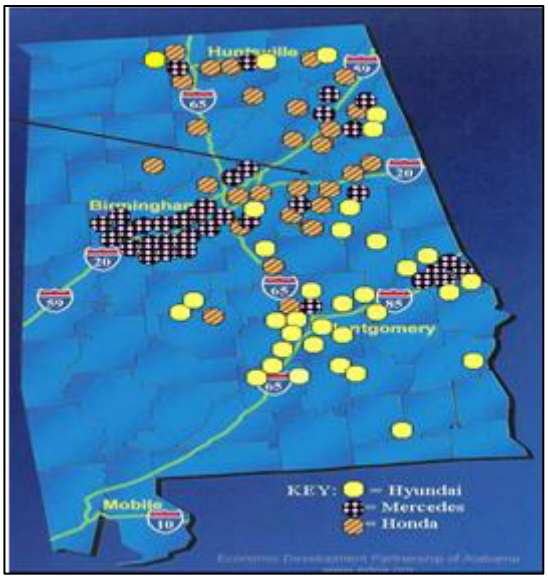
Auto parts industries are well represented in Appalachia and are also a source of income to the region, as their products are "exported" to the rest of the US and world. An important evolution in this industry over the past twenty years has been the evolution of parts manufacturing locations. While they were once located in the immediate vicinity of the assembly plants, today the plants are dispersed along several hundred miles of the "Auto Alley," a manufacturing corridor along I-65 and I-75 (see Exhibit 2-9b). This firm location pattern was enabled by advanced information technologies that allowed just-in-time production processes to utilize parts plants located wherever they can reliably provide same-day delivery.

Exhibit 2-9 shows the location of auto supply plants in and around the Appalachian Region. Exhibit 2-10 shows the key origins and port destinations of Appalachian auto parts that are exported beyond the US. Both maps illustrate the importance of highway corridors in enabling the growth of this industry in Appalachia.

Case Study. An example of a dispersed supply chain is shown in Volume 2 focused on Alabama's automotive assembly and parts economy.

Exhibit 2-9 Maps of Dispersed Auto Assembly and Supplier Locations

(A) AL Auto Assembly & Parts Plants ***(B) Southeast Auto Alley Corridors***



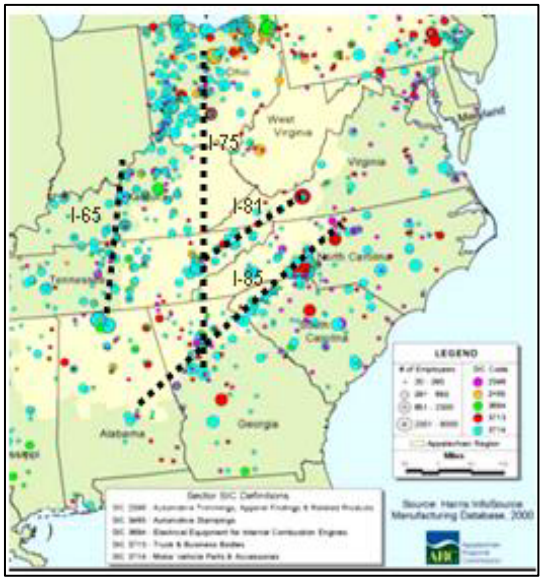
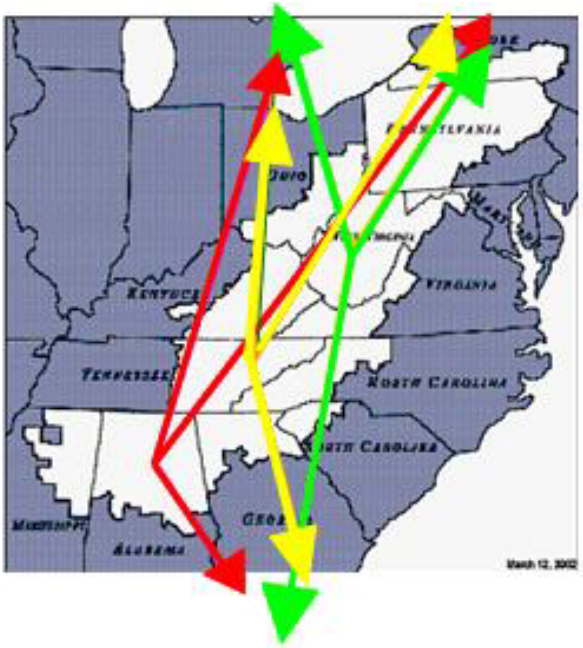


Exhibit 2-10 Major Flows of Auto Parts Exports from Appalachia
(from state of origin to port of exit from the US)



Note: key exit ports are Miami, Detroit and New York City
Source: Jack Faucett Associates and Economic Development Research Group, 2004.

2.5 Natural and Cultural Assets

Natural Resource, Amenity and Cultural-Based Development -- Economic growth based on the natural and human-made assets of an area. The traditional form of asset-based development has been based on natural-resource assets that are tied to extractive activities such as mining and logging. Other natural amenity and cultural resources may attract eco-tourism, vacation and retirement industries and their supporting visitor services, as well as attract entrepreneurs.

(A) Overview of Asset-Based Development. The Appalachian Regional commission has defined assets as the natural, cultural, and structural assets, and "the hospitality, work ethic and can-do attitude of its residents." Asset-based economic development practices have been implemented in communities throughout Appalachia since the 1960s. It is useful to divide the basis for asset-based development into two groups:

a) *natural and cultural-based development*, which depend on an area's pre-existing features (including physical features, amenities and cultural/historical attributes), and

b) *learning-based development*, which depends on cultivating worker skills and capabilities (including entrepreneurship, education, and research/development activities).

This section (2.5) focuses on group "a". The next section (2.6) focuses on group "b". As discussed below, the theory of asset-based development draws upon aspects of Ricardo's comparative advantage theory, Alfred Marshall's concept of the "industrial district" and Porter's interpretation of theory on cluster formation. Some of the recent economic-geography studies on asset-based development in Europe also provide insight to this study. The cultivation of entrepreneurship, social-capital formation, and local-knowledge spillovers are the overarching drivers for asset-based growth.

- *Natural amenity-based development*: Kusmin et al. (1996) indicate that traditionally, there is evidence that natural amenities are a factor contributing to population and employment change, hence regional economic development, in the United States. In the 1990s, the Economic Research Service (ERS) staff of the U.S. Department of Agriculture (USDA) conducted two studies, including a literature review and an empirical study to investigate factors that may have affected rural economic growth in the 1980s (Aldrich and Kusmin 1997). In the literature review, they identified temperature and precipitation as the two major factors facilitating rural economic growth.

- *Natural resource-based development:* Land-based mineral and forest resources provided a comparative advantage that accounted for much of the initial

economic development of Appalachia in past centuries. However, natural endowments are sometimes regarded as a "curse" for long-term development. Today, those industries are seen as mature and in some cases declining sources of jobs. Most areas of Appalachia that have historically been dependent on those industries have been seeking to diversify their economic bases. Accordingly, the rest of this discussion focuses on the other four categories of asset-based development.

- *Culture-based development*: Pratt (1997) defines cultural industries as products, performance, in the form of fine art and literature; their reproduction, as books, magazines, TV and radio programs, recordings and etc., and activities that link together art forms such as advertising. He includes also the production, distribution, and display processes of printing, and broadcasting, as well as museums, libraries, theatres, night clubs, and galleries. Andersson (1985) argues that there six key drivers to the growth of cultural industries, including (1) a sound financial basis, but without tight regulation; (2) basic original knowledge and competence; (3) an imbalance between need for cultural products and their actual provision as the new environment calls for new cultural products; (4) a diverse milieu; (5) good internal and external possibilities for personal transport and communications, and (6) an uncertainty about the future, which calls for creative change. In his overview article, Hall (1997) reviews other analysts' work and stresses the importance of initial wealth effects and the randomness of the development.

(B) Theoretical Foundation and Measurements. An asset-based strategy may have different effects on the economic upgrading of a region depending on the asset types. Tangible assets, such as coal or timber, may accelerate economic development only for a short period of time, but the development may not be sustainable, as shown by history in the Appalachian Region. However, smart use of the tangible assets can lift the region through the early growth stages and facilitate more sustainable growth if careful use is made of intangible assets, such as education or entrepreneurship. These intangible assets may be difficult to establish on a sustainable basis, but they are the backbone of healthy long-term economic development and link closely to the learning-economy approach to development used in a number of northern European communities (Asheim 1996).

An analyst can view an asset-based growth strategy as complementary to other growth strategies, and it often serves as a base for other development strategies. For example, the agglomeration of firms of a certain industry in a place is often decided by the availability of the labor force, which is highly related to educational requirements. In certain types of manufacturing industries may seek locations with lower-skilled workforce to avoid a wage premium. Another example is tourism: natural assets such as climate, topology, local culture, and geographic locations serve as a foundation for higher-level development strategies. In an environment of high bio-diversity, an eco-tourism development strategy is more feasible than otherwise.

In terms of methods analysts use to measure the presence or maturity of asset-based growth patterns related to tangible assets, they often use many variations of the input-output analysis and the economic-base analysis, including mix-and-share analysis and location quotients (Broadberry 1998; OhUallachain 1991; Riefler 1979). In the case of some intangible assets, such as entrepreneurship or culture, case studies, e.g. asset-mapping, can be the first step to investigate the presence of such assets.

Researchers can conduct multiplier analyses for regional development planning, but they must interpret the results of such calculations cautiously. As an example, they should not necessarily encourage the sector with the largest direct economic impact to expand in a region for several reasons, including that the benefits may not be retained in the local area, large multipliers for a sector do not always imply a large multiplier for sub-industries within a sector, and there are often significant differences between the employment, income, and output multiplier effects for a given industry in a given region (Miernyk et al., 1970; Schaeffer 1998; Smirov-Smirova 2000).

(C) Resource Extraction. One of the potential big traps in asset-based development is resource extraction in the name of competitive advantage, which can result in local poverty and boom-and-bust cycles. There are two issues here: the local multiplier of the ensuing development and overspecialization of the economy.

In terms of the local multiplier of the industry, the development of the coal industry in the ARC region is a good case example. Duncan (1992) concluded in her book that although the result of fierce competition in the coal industry was cheap energy to fuel industrialization in the Northeast and Midwest, the costs were severe for miners and their families. In the twenty-first century, with rising oil prices, the hope of sp,e profit from coal has resurfaced. At least 94 coal-fired electric power plants—with the capacity to power 62 million American homes—are now planned across 36 states. One industry observer commented that "the situation has changed 180 degrees in the last year, so that we're almost back to the point where we were in the 1970s with a slew of coal-fired plants on the drawing board." (The Christian Science Monitor 2004) Currently, Eastern spot prices for coal are hitting peak levels. Some urgent buying of Eastern compliance coal on the spot market can run $65 per ton, compared with the mid-$20 range of a few years ago. Alan Stagg, head of the West Virgina-based Stagg Resource Consultants, said that the current situation reminded him of the coal boom of 1974. He also remembers that it took decades to wring out the excess mine capacity that came online and cure many of the bad habits that resulted from that brief boom period. Stagg told the EUCI (Electric Utility Consultants Inc.) conference on volatile coal markets that he sees many parallels between then and now. (Power Daily, 2005)

With the current reentry of investors into the mining industry in the Appalachian region, policy makers need to evaluate the costs and benefits of the mining industry to the health of local economy, especially in terms of overall stability and the portion of benefit accruing to the local communities. In the next phase of development, the Appalachian region needs to think carefully about how to build a strong, diversified, and resilient economy based on local-assets with the local communities as the chief

beneficiary. Coal and timber, undoubtedly, could play an important role in this development phase, but as policy makers design development strategies, they should emphasize ways in which the change and/or expansion of these sectors can help the region grow as well as become sustainable.

(D) Natural Amenity-Based Development: the Retirement Industry. Asset-based development is a development strategy with wide applicability. Policy-makers start from within the economy, understanding and cultivating the local strengths. A prevalent form in recent years has emphasized natural-amenities of a region. The retirement industry is based on local amenities, and typically has a low intensity of use of natural resources. The migrant retirees spend locally, and the income usually circulates within the local area. The spending also has a direct impact on high job-creating industries, such as hospitality, construction, and health care. For example, as the top retiree destination Florida, mature residents, while making up one-third of the state's population, account for about one-half of all income and consumer spending (The Destination Florida Commission 2002).

Although the retirement industry already began to gain favor among regional planners during the late 1980s and the early 1990s, its significance is likely to increase markedly in the future when the baby-boom generation retires. In 1995, the U.S. Census projected that 25 million people (pre-boomers) were in the 50-59 group who are currently planning retirement, among whom 17 to 38 percent may move from their home states to retire (Reeder 1998). This would represent a large and growing market for retirement destinations.

Researchers have identified both advantages and disadvantages of the retirement industry to local communities. On the one hand, according to the USDA research, the retirement industry manifests its benefits by "population growth, increased family incomes, greater economic diversification, and reduced unemployment rates." Contrasting sharply with income stagnation or decline in most other rural areas in the 1980s, the median income in rural retirement-destination counties (15% or more net immigration of those age 60 and over) increased by 4 %. On the other hand, not all retiree impacts are positive. Retiree attractions can result in undesirable congestion and environmental strain and drive up housing prices and property taxes. Many of the jobs created by retirees are low-wage service jobs, and retirees may require more of the public health services, which drains local public-financial resources. (Reeder 1998)

Many states have been actively promoting the retirement industry, adopting a wide variety of strategies. In Alabama, the State government has been an active agent for attracting retirees, including State marketing and retiree-related development investments. In Arkansas, the private sector, like real-estate associations, has taken the lead in developing a comprehensive attraction strategy. In South Carolina, new residential developments, including planned retirement communities, play a major role in attracting retirees. In North Dakota, the focus is on attracting former residents back into the community and filling existing vacant housing. In Washington, the state

chose the relatively inexpensive community self-help model. For example, Chelewah, population 2000, attracted 150 new residents, most of them retirees, in one year with a $10,000 promotion budget of distributing brochures and making videos. The marketing methods also vary from integration through tourism (North Carolina), to traditional marketing media, like newspapers, magazines, television, and radio (Alabama), financial incentives like tax breaks (Michigan and Mississippi), and even word-of-mouth advertising (Idaho and North Dakota). (Reeder 1998)

As summarized by Longino et al. (2005), there are three typical motivators behind the phenomenon of retiree migration: (a) move to warmer weather; (b) move down the metropolitan hierarchy to smaller cities and towns; and (c) move from higher to lower cost-of-living areas. Retirement migration has historically been concentrated in a relatively few states, but has shown tendency of seek out other locations. There are three challenges that Appalachia's regional policy makers will face in order to develop along this path: first requires formulating a unique marketing position to win in an increasingly competitive retiree market; second involves building upon human-made amenities and natural amenities to make the latter even more attractive; third is knowing in advance what the long-term economic and environmental impacts are related to an established retiree industry.

(D) Recreation/Tourism Asset-based Development. In contrast to resource extraction, natural assets can also be utilized to develop a sustainable recreation and tourism sector. Conventionally, tourism builds on local natural assets, such as mountains and lakes; and plays an important role in economic development. The World Travel and Tourism Council estimates that travel and tourism is now the world's largest generator of jobs. In 1995, the industry provided direct and indirect employment accounting for 10% of the global work force and providing one in every nine jobs. Tourism is labor-intensive and provides immediate employment opportunities. Many tourism activities are within the reach of the small operator. As many of the natural beauties are not located in the city centers, but in the rural areas, tourism allows rural peoples to share in the benefits of tourism development, promoting more balanced and sustainable forms of development.

Sustainable Tourism can be defined as the means to "… meet the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems." (World Tourism Organization 1988, quoted by UNEP Report 2002 P2) Among the many forms of sustainable tourism, Ecotourism is one of the most prominent in recent years. Ecotourism is defined as a form of tourism whereby tourists travel to destinations where natural environment (flora and fauna) and cultural heritage are the primary attractions. Ecotourism emphasizes the support of the local economy and its indigenous atmosphere and the preservation of entire local ecosystems and promotion of the importance of conserving nature.

Natural assets and tangible assets are not necessarily the determining factors in recreation/tourism industry development. The importance of cultural heritage cannot be neglected in the development process. In the Appalachian region, "Cultural tourism is the type of 'asset-based development' that can produce permanent jobs in the region, drawing on the region's music, history, environment and warmth of its people", according to Governor Mark R. Warner and Anne B. Pope, federal co-chair of the Appalachian Regional Commission. As a joint effort by National Geographic and the Appalachian Regional Commission in 2005, more than 350 of Appalachia's top cultural tourism destinations are featured on a color map. Local music and crafts industry are important components of the cultural tourism industry. One of the ARC states, Virginia, ranks in the top 10 states in the nation as a cultural tourism destination. Cultural tourism is growing twice as fast as traditional tourism, and cultural tourists tend to spend more than others. (Richmond Times-Dispatch 2005)

(E) Implications for Asset-Based Economic Development. From the discussion above, two important implications stand out for asset-based development: sustainability and local economy as the main beneficiary.
Sustainability refers to sustaining the asset-based economic development without over-extracting the local resources, resulting in environmental deterioration. Success in asset-based economic development depends on long-term investment and a building-block process rather than a quick-fix approach. An important part of asset-based development is to build a foundation, such as infrastructure, for asset-based development and to enhance the local assets constantly instead of depleting them (ARC 2004).

More importantly, how much of the benefit of the economic development can be retained and circulated in the community. Two of the most useful indexes are the local income multiplier and the local employment multiplier. As our earlier analysis exemplifies that coal mine workers suffered from low income when the mining business prospered. More questions should be asked for the sake of the real benefit of the local people. What is the quality of the created jobs? Are the jobs created at the expense of existing local jobs? How much lead time is there before the development can take off from the date of investment? To what extent do the extra jobs trigger multiplier benefits elsewhere in the ARC region? Local planners must fully explore these questions before undertaking the asset-based development initiatives.

On the execution level, asset-based development has two levels of implications for local policy, the industrial development level and the community revitalization level (Polenske 2001). On the industrial development side, policies should promote innovation and the evolution of an industrial network based on an evaluation of local assets. Perroux (1988) illustrated this point clearly by defining a growth pole as a set of economic activities that has the capacity to induce the growth of another set of economic activities in an innovative way. On the community-side, policies should focus more on building, appreciating, and mobilizing individual and community talents, skills, and assets rather than focusing on problems and needs. Also, the

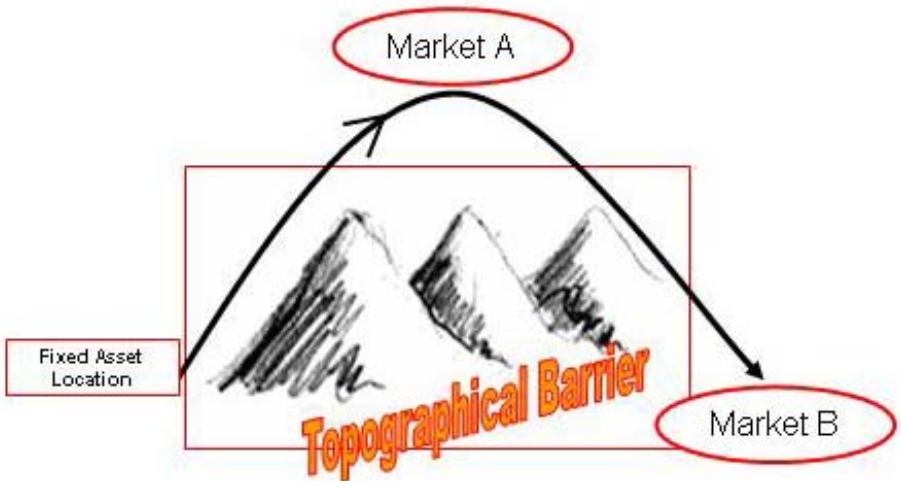
development process is supposed to be led by the community rather than driven by external agencies.

Asset-based development strategy has the potential to be central to the Appalachian regional development as the area has rich natural, cultural, and human assets "sleeping" in the mountains. Joint government-community initiatives in the region have the potential in increase opportunities for development to take off through various mechanisms. They may include education-based, entrepreneurship-based, resource-based, culture-based, or natural-amenity-based processes.

A remaining issue for asset based development is access to customer markets. Such access issues hold whether the customers themselves travel to the region to obtain the products (e.g., tourism) or the products are delivered directly to the customers (e.g., wood products). Exhibit 2-11 illustrates the key issue of topography and transportation links, which can affect the markets available for access to/from a region's fixed assets.

Case Studies. Examples of natural and cultural asset-based economic development are shown in the Volume 2 case studies of Southeastern TN and Southwestern NC, and also discussed in the case study of Chautauqua County (NY).

Exhibit 2-11 Role of Market Access and Topography in Asset-Based Development



2.6 Learning-Based Development

Learning-Based or Knowledge Asset-Based Development. Growth opportunities leveraged from the collective knowledge embodied in the region, including social capital, technical applications / commercialization, institutional assets (educational and financial), entrepreneurial start-ups.

(A) Overview of Learning-Based Economic Development. Forms of economic development that are based on knowledge and learning are focused on the development of business-related skills among the local workforce. They include:

- *Education-based development*: Education institutions contribute to economic development through "research, creation of human capital through teaching, technology development and transfer, and co-production of a favorable milieu." (Goldstein and Renault 2004) According to their research, among these drivers, the spillover of university research and technology creation contributes most to regional economic development. There are two types of education assets-based counties: (1) counties that are the sources of well-educated people due to the location of universities, and (2) counties that absorb well-educated people in their labor market.

- *Entrepreneurship-based development*: In a market with perfect information, the development of entrepreneurship would not be necessary. In reality, entrepreneurship contributes to development by overcoming uncertainties, factor-market imperfections, and externalities by individual initiatives and skills (Leff 1979). The key drivers of entrepreneurship-based development include the overall quality of human resources in the area, the cultivation of an entrepreneurial culture, the establishment of property rights to protect profits gained from entrepreneurial activities, and the establishment of supporting institutions, such as financial agencies targeting small businesses.

Currently there are two parallel streams of thought and research about learning-based economies, both dating back at least a century. "Human capital" theories are top down, driven by public institutions and public policy. "Learning region" theories are bottom up, driven by social norms, associational structures, and workplace organization. The more traditional and widely accepted human capital view of learning is tightly linked to research on education and training—human resource development (Ross and Rosenfeld, 1988). This line of research focuses on demonstrating the value of education, educational attainment, and skill development to regional or national economic outcomes. The research that correlates measures of educational attainment or achievement to economic outcomes, dates back to Horace Mann's circulars, which asked business owners in Massachusetts to estimate the dollar value of educated workers to their profits.

Newer (or, more accurately, rediscovered) learning theories assume that the economic development of regions is linked to the informal knowledge that is embodied in and transmitted through the social and organizational structures of businesses, communities, and societies. This idea that access to the non-codified, or tacit, knowledge that resides in people's heads and organizations' routines drives innovation dates back to the beginning of the 20th century. Alfred Marshall attributed the success of industrial districts to the informal flow of ideas and information. This hypothesis is more resistant to quantification, and generally demonstrated with anecdotal evidence.

Both of these lines of research of research are investigated as they affect and are affected by non-metro conditions and industry agglomeration. The first is based on traditional human capital theory and focuses on the individual. The second is based on "learning" theories as applied to people, companies, and places, and requires some store of social capital. Human capital assumes rationality and transparency; learning occurs through socially determined values and norms (Schuller, 1998).

(B) Theoretical Basis on Human Capital Development. Relationships between human capital and economic development in rural areas have been acknowledged and thoroughly studied for decades. The importance of education to economic development in rural areas was a significant part of Roosevelt's Carnegie Commission Report on Rural Life highlighted the importance of education to rural economies. Human capital theory presumes that the knowledge and skills of the work force are contributing factors to economic growth. In conventional econometric models, human resource development accounts for anywhere from 20 to 80 percent of growth. Increased skill and knowledge, when applied to work situations, leads to higher productivity and increased innovation, which is used to justify public expenditures on training and induce businesses to invest more in education and training. Some economists have shown that the contribution of knowledge and education to productivity far exceeds that of capital (Carnevale, 1983). This suggests to both governments and businesses that investments that increase the value of human capital produce higher rates of return than investments in physical capital, and therefore they would be wise to invest in education and training (Schultz, 1981).

Modern human capital concepts developed by Schultz and Gary Becker and, with respect to agglomeration, by Paul Krugman provide a theoretical basis for the importance of human capital, and Ray Marshall, Eli Ginzberg, Sar Levitan and many others have provided a more practical set of principles for human resource development policy. Schultz's research led to the additional finding that "the supply of entrepreneurial ability is definitely increased by additional schooling."

There are basically three ways that human capital plus the system that develops it contribute to non-metro economies. The first is *direct*, the impact of a more skilled and creative workforce. The second is *induced*, the impact of better education on the location choices of employees and employers. The third is *contributory*, the impact of education and training institutions and organizations as a source of employment and external revenues.

Incumbent and potential labor force. The more common means for assessing human capital is to estimate the scale and productivity of the workforce. Scale is measured in total numbers of people in the work force, diplomas, certificates, and degrees awarded, number completing relevant programs of study, and average levels of educational attainment in the population. The numbers of college graduates in the Appalachian counties of most ARC states is significantly below those in non-ARC counties (Haaga, 2004). Occupational projections, however, suggest that about eighty percent of the work force over the next ten years will require some postsecondary education.

In fact, one of the most serious human capital challenges for rural areas over the past century has been keeping youth, particularly the most educated youth, from leaving for urban amenities and better job opportunities. No one, however, has solved the persistent problem of rural out-migration. While educational attainments levels have been rising in the U.S. constantly, gains in metro counties far exceed gains in non-metro counties, and non-metro non-adjacent counties fare the worst (Artz, 2003).

Advocates for education and training argue that companies benefit from a more highly trained workforce but findings don't fully support this hypothesis—at least for manufacturing. A study of the non-metro South in the 1980s found that a 10 percent increase in educational attainment resulted in a 3.8 percent increase in total employment—but a net loss in manufacturing employment (Rosenfeld et al, 1986). A review of the literature on plant locations conducted in 1994 concluded that "education levels of the local work force have not been important determinants of local employment growth in the rural areas of the United States (McGranahan, 1994).

A more recent study on impacts of education discovered modest gains—that a five percent increase in share of population attending college in non-metro counties is associated with a 0.15 percent increased in annual income growth of $325 annually (Barkley, 2005). A concurrent study found that a one percent increase in high school completion rates among adults resulted in an additional $128/year per capita income.

Business Decision-making. The historical finding of a weak relationship between education and traditional manufacturing is not really surprising, since traditional manufacturing has lower skill requirements and fewer requirements for technical expertise. Among rural manufacturers asked in 1996 to name the top five barriers to competitiveness, only those in the Southern region listed quality of primary and public schools, and there it was number five, well behind quality of labor, amenities, regulations, and taxes (Teixeira, 1998).

But in today's economy, with less labor intensive manufacturing and more knowledge based industry, conditions are very likely quite different. A recent USDA Economic Research Service study showed that the share of rural employment in rural low skilled jobs declined from 49.4 percent in 1980 to 42.2 percent in 2000 (still far above the US average of 35.5 percent). More of the decline was attributed to changes in skill needs due to technology within industries than to changes in industrial mix (Gibbs, 2003).

Direct Employment. The education and training institutions represent a large direct source of employment and, where concentrated, can constitute a sizable portion of total regional employment. About six percent of all employment in the United States is in the education sector, and the projected growth rate is almost 25 percent, which is 67 percent above the overall national employment growth rate. In rural counties, the proportion working in education is usually even greater. Since most of the revenues are from state or federal sources, education is a value added industry from the local perspective.

Agglomeration effects. Agglomeration has three impacts on human capital. The first is the effect first described by Alfred Marshall (1936) in industrial districts, that "workers by associating with one another teach one another." He argued that innovation is a collective experience and that "If one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas (Bellandi, 1988). Further, he hypothesized that association leads to learning. (Marshall, 1936). Marshall refers to processes of transmission of ideas that occur through inter-firm mobility of skilled workers, social institutions, and business organizations.

Krugman later developed economic models to demonstrate Marshall's theories that pooled markets for workers with specialized skills result in clusters. His model explains why the advantages associated with access to labor pools with specialized skills outweigh the disadvantages of potential poaching of employees by competitors (Krugman, 1992). Clusters should also benefit workers because they would be less dependent on fewer employers and also protected against fluctuations in demand. One study did indeed show that the presence of clusters (based on the most basic two-digit industry classifications) is associated with higher wages even after accounting for characteristics of workers (Bernat, 1998).

A second agglomeration effect is in the increase in workforce development networks formed among companies with similar needs. A survey of 1,600 employers and 250 community colleges in the rural U.S. found that employers rely heavily on networks. The author identified four structures for the networks: sole providers; hub-spoke, usually with a community-based organization (CBO) at the center; employer-centered networks; and sector- or cluster-oriented cluster networks (Green, 2003). The networks were most often industry specific (44 percent), community specific (38 percent), and supply chain driven (26 percent).

The third advantage of agglomeration is that the workforce is more likely to have learned special knowledge of the peculiarities of the structure and work environment common to the cluster, giving them context-specific skills they can apply more directly to the work environment of the cluster. This was the rationale behind the requirement that has been part of the federal Carl Perkins Act since 1984 to teach "all aspects of the industry," that employees who understand the way their industry works are more productive and have more opportunities to advance.

(C) Learning and Industry Clusters. Learning has always been, and remains, one of the most fundamentals reasons for, and value of, regional agglomerations of like and related companies, or clusters. Technological advances in communications have not, according to most analysts, replaced the Informal learning across a sector, or cluster, has a long tradition in rural America, with roots in the Grange, the Farmers Alliance, and the populist movement—all of which intentionally facilitated the free exchange of agricultural knowledge throughout the industry. In non-agricultural settings, much of

Agglomeration Effects. Alfred Marshall's work focused on learning as a critical factor in industry agglomeration. Contemporary concepts of learning regions are included within the recent deluge of literature on industry clusters, districts, and networks, especially out of Europe. It includes learning ranging from informal/unintentional to structured/ intentional and from what Peter Maskell calls "local buzz" to "global pipelines." Much of the technology transfer literature focuses on creating opportunities and building structures for knowledge spillover.

One of the leading economic advantages of clusters is the opportunities for knowledge spillover and know-how trading. The disadvantages associated with leaking proprietary knowledge are outweighed by the advantages of learning about new technologies and techniques, through both formal and informal means. Von Hippel's research on informal know how trading in the U.S. steel industry found that exchange among competitors is most effective when know bow is proprietary only by virtue of secrecy and when its value is too small to justify an explicit contract (Von Hippel, 1987). However, "sharing activity is not captured as a transaction in the firm's financial records and therefore it is not reported as economic activity in the standard economic statistics."(Cater, 1989). Krugman agreed, writing that "knowledge flows [in contract to labor pooling] are invisible; they leave no paper trail by which they may be measured and tracked, and there is nothing to prevent the theorist from assuming anything about them that she likes."

Learning occurs in clusters in a number of ways, some of which fall under the rubric of "networks" and up and down "supply chains" and other organized forums for associative behavior," through gatekeepers, which can be lead firms of institutions, and some of which fall under the less intentional and formal "social capital." These can include participation in local associations, networks of firms, mobility of personnel among firms, informal social activities or via "gatekeepers (local institutions, lead firms, or community leaders).

Maskell (2000) developed a "learning-based theory" of clusters in which he contended that learning is an explanation existence, internal organization and boundary definitions of the cluster. The cluster and learning theory literature leads to the hypotheses that the more similar and/or complementary the company, the more likely companies are to interact, watch, discuss, and compare solutions to similar problems, and learn from each other and that proximity increases the likelihood of interaction and learning among companies. Learning occurs through both formal structures, such

as networks and associations and through informal social venues that depend on stocks of social capital.

Networks, alliances, and associations. Four types of network arrangements have been found to facilitate learning but also to reduce the costs of training. One is an unintentional outcome—at least from, a policy perspective—of inter-firm collaboration for business purposes. One is the intentional formation of skills alliances among firms, which supplements formal human resource development with informal learning among members. Another is the top-down supply chain network, with information flowing from customer company/mentor, company to suppliers, but also back up the chain with the specialized knowledge of the suppliers and smaller companies. The last is the sector or cluster association that builds relationships of trust and provides venues for knowledge exchange. These networks are operationalized by supply chain associations, regional skills alliances, cluster associations or councils, or gatekeeper organizations.

While most of the government strategies to encourage and support small and mid-sized businesses to work collaboratively through networks have targeted hard business outcomes, the companies themselves have been much more interested in learning as an outcome. Evaluations of network programs in the western region of the United States, Wales, and New South Wales in Australia all found that the highest ranked priority for company involvement in networks was learning. Michigan turned this into a state policy by funding Continuous User Improvement Networks of companies with similar interests. Similarly, the recent spurt of interest in forming cluster councils or associations has to do with sharing knowledge.

- *Supply chain learning associations* - One form of inter-firm learning occurs though the supply chain learning and training networks, where original equipment manufacturers join with their suppliers or users to ensure that all have the skills required to meet efficiency and quality goals. This was the official innovation strategy for Wales, with supply chain associations formed around each of its multinational branch plants (Morgan, 1967). It's important to bear in mind that knowledge chains are not simply captured by value chains compiled in input-output tables. Many of the companies in value chains are merely engaged in currency transactions while some companies not involved in currency transactions are engaged in knowledge transactions.

- *Regional skills alliances* - Regional skill alliances (RSAs) are multi-employer worker training programs organized on the demand side of the labor market. They are by definition demand driven; they address employers' training and skill development needs. An effective RSA gives each employer access to lower cost or higher quality training than would have been available to the individual firm. Broader-based RSAs include the public sector, education and training organizations, and frequently organized labor. The Southwestern Employers' Training Consortium (Pittsburgh) links firms who have identified shared skill needs across industries and occupations.

- *Cluster associations* - Cluster organizations that represent sectors or clusters, either formed by members spontaneously or by government agencies in response to cluster initiatives, are also venues for knowledge transfer. Some is transferred intentionally to benefit region collectively and some is transferred quietly, among colleagues and business partners and associates who expect that they will receive as much intelligence as they reveal. In an evaluation of four cluster associations in Washington and Minnesota (two in wood products, one in engineering, and one in crafts) members of the associations placed a much higher value on "access to information and learning" than they did on "hard" outcome such as new products or markets (Rosenfeld, 1996).

- *Gatekeepers* - Within regions and clusters, certain lead firms, institutions, or specialized services function as gatekeepers and disseminators of knowledge and know how. In some clusters it's the multi-nationals that are closer to global markets and new technologies. In other clusters it's an institution—usually a specific center or program faculty at a community college or university—that is responsible for generating and accumulating knowledge and know how and works with large numbers of companies. In still other regions, it's a purchasing agent or exporter used by many firms or a sector based nonprofit. ARC sponsored an analysis of business intermediaries that fill this role but research was limited to the services provided, not as sources or disseminators of knowledge.

Social capital and norms of reciprocity. Social capital has become a popular un-traded asset of regions and assumed to influence economic development, despite the lack of any compelling studies. There have been, however, repeated observations on site that social capital produces learning and learning creates social capital—which in turn affects innovation and productivity (Maskell, 2001). A tight social fabric has been considered fundamental to the functioning of the classical Italian industrial districts. Brusco (1995) noted that "local know-how is passed on by doing things and seeing how other people do things through informal chit-chat" and workplace knowledge is rooted in places where "people are linked by the bonds of shared history or values…and where codes of behaviour, lifestyles, employment patterns and expectations are inextricably implicated in productive activity."

There are formal associations in Italian industrial districts. However, the social structure in northern Italy is embedded in the community and the associations appear to be valued more for their collective services than their contributions to social capital. In the United States, though, new urban centers lack the shared history and culture to form the same kinds of bonds that have supported the exchange of production-based knowledge in Italy. Further, as work becomes more knowledge based, the functions and skills become less transparent to the community at large. Therefore regions that want to build economic development policies around clusters try to create social settings that will encourage the learning that Brusco attributes to Italian industrial districts. In the U.S., much of the economic value of social capital may in fact be the

unintended consequence of something else—such informal chitchat at company bowling leagues.

One form of social capital-based learning is the more general information that advantages the region without disadvantaging the firm. Those firms that are part of global pipelines have little to lose by sharing their knowledge, and strengthening their cluster may provide an advantage in the form of a recognized brand. The other social capital-based learning depends on reciprocity.

Exhibit 2-2. Mechanisms for Learning

Mechanism	*Units of Analysis*	*Form*	*Constraints*
Intra-firm	Individuals	Structured	Resources and company policy
Inter-firm Intentional	Networks & associations	General & selective	Time pressures and potential rivalry
Inter-firm Unintentional	Clusters	Unstructured	Business isolation
Casual	Communities	Unstructured	Social isolation

Perhaps the most widely cited researcher on social capital and clusters is Annalee Saxenian 1994). Her research on Silicon Valley led her to conclude that the "major purpose of these organizational structures was to facilitate the exchange of ideas and information." Entrepreneurs view social relationships and even gossip as a "crucial aspect of their business." "Entrepreneurs came to see social relationships and even gossip as a crucial aspect of their businesses....such informal communication was often of more value than more conventional but less timely forums such as industry journals." "In many cases, the flow of information between the two firms was continuous, occurring across different levels of the organization and different functional specializations." A more recent survey of 445 SMEs across Great Britain found that innovative companies were more likely to exchange information outside normal commercial relations, rate collaboration higher, and rate external information form other SMEs more highly than non-innovators (Cooke and Clifton, 2002).

Limitations of social capital. While social capital bring economic benefits to regions, it can also restrict who has access to those benefits, and, if it becomes too inward directed and insular, be harmful to the region's competitiveness. The social capital that serves a cluster does not automatically benefit all firms, people, and places equally. A report from the Organization for Economic Cooperation and Development hypothesizes that "the increasing importance of individual learning within the knowledge based economy produces new forms of social inequalities, through the intensification of the disadvantages experienced by those denied access to learning opportunities" (OECD, 2001). The Aspen Institute noted that cluster-based initiatives aimed at low-income populations are defined "not simply by absence of resources but

by the absence of marketplace relationships that can create opportunities of value to both participants and employers" (Clark and Dawson, 1995). Associations may have exclusionary guidelines. They may meet in places not easily accessible to everyone or operate internally as a "club" in which some insiders gain access to tacit knowledge while others do not. Tightly controlled associations can act as "gated communities" where those not considered part of the "business community" operate at a distinct disadvantage.

Secondly, poorer and socially isolated regions and populations too often have insufficient access to benchmark practices, innovations, markets, and jobs outside of their region or neighboring regions. While social capital is the medium that transports information and accelerates imitation *inside* a cluster, competitiveness is highly dependent on new information and ideas *outside* the cluster. Successful regions have lead firms or associations that either attract or are part of global networks and markets and that employ people who are active in international professional associations and maintain extensive personal networks.

(D) Implications for analyzing growth patterns. Efforts to build stronger economies in Appalachia since the establishment of the ARC have focused on human resource development. After infrastructure, nothing has received more attention or resources from the ARC. Human capital has long been a priority, and in support of a modern vocational education system the agency contributed to the construction of some 700 vocational-technical schools and community colleges in the region (Coulombe, 2004).

However, the federal government is a small player in supporting public education and training (usually no more than about five percent), and the major burden falls on the state and local governments. The poorest ARC regions, which need good schools the most, have the lowest tax bases and are least able to keep youth in school and raise levels of human capital enough to support economic growth. Even with more money, diseconomies of scale and social and physical isolation make it difficult for many parts of the region to attract highly qualified teachers, provide specialized programs and services, and keep the highest performers and most talented graduates in the community. Therefore, the levels of education of adults in non-metro ARC counties are among the lowest in the nation.

Decades of educational and school finance reform, the Internet, and innovative approaches plus the efforts of dedicated teachers and principals, and CBOs, have had positive results. Measures of human capital in rural areas have improved considerably and closed the gap with metro areas. But on average, they still fall well below those in the suburbs and cities, and the issues that keep rural areas behind haven't changed much. They are: (a) limited financial resources, (b) inability to attract the best teachers. Higher pay and urban amenities attracts teachers to cities, (c) lack of school choices, and (d) out-migration of young adults.

Networking is more common in rural places than in more impersonal cities. The real challenge for Appalachia is access to external knowledge. The "local buzz' is strong but the "global pipelines" are weak. Rural places are generally more culturally homogeneous and have limited access to innovations, ideas, benchmarks, and market opportunities from other places, and major barrier to innovation and economic development.

Case Studies. Examples of learning-based technology economic development based on technology and education centers are shown in the Volume 2 case studies of Pike County, KY and Monongalia, County, WV.

2.7 References Cited

(A) General Economic Development

Berry, Brian J. L. and William Garrison, 1958. "The Functional Bases of the Central Place Hierarchy," Economic Geography, 34 (1958), pp. 145-54.

Blumenfeld, Hans. 1955. "The Economic Base of the Metropolis." *Journal of the American Institute of Planners*, Vol. 21, p. 114-32.

Klosterman, Richard E. 1990. *Community and Analysis Planning Techniques*. Savage, Maryland: Rowmand and Littlefield Publishers, Inc.

Porter, Michael. 1990. *The Competitive Advantage of Nations.* New York: The Free Press.

Enright, Michael J. (2001) 'Regional Clusters: What we know and what we should know.' Paper prepared for the Kiel Institute International Workshop on Innovation Clusters and Interregional Competition.

Rocha, Hector O., (2002) "Entrepreneurship and Development: The Role of Clusters." *Small Business Economic Journal*, 2002

Weisbrod, Glen and Brett Piercy., (2006) "New Tools for Economic Development Targeting and Strategy", Economic Development Research Group, September 2006.

(B) Trade Center Development

Alberta Bureau of Economic-development and Tourism. 1992. *Communities on the Grow: Economic-development Bulletins*. Edmonton, Canada.

Cromartie, J. and Linda Swanson, 1996. "Defining Metropolitan Areas and the Rural-Urban Continuum: A Comparison of Statistical Areas Based on County and Sub-county Geography." Washington, DC: Rural Development Perspectives, Vol. 11, No. 3, pp31-39, June 1996.

DTI (U.K. Department of Trade and Industry). 2003. A Practical Guide to Cluster Development. http://www.dti.gov.uk/clusters/ecotec-report/download.html.

Economic Research Services (ERS), U.S. Department of Agriculture. "Measuring Rurality:

Micropolitan Areas." http://www.ers.usda.gov/Briefing/Rurality/MicropolitanAreas

Economic Research Services (ERS), U.S. Department of Agriculture. "Measuring Rurality: Urban Influence Codes." http://www.ers.usda.gov/briefing/rurality/UrbanInf

Engardio, P, Roberts, D., (2004) 'The China Price.' Business Week. December 6. Internet Retrieval.

Edward J. Feser and Malizia. Emil. 1999. Understanding local economic development. New Brunswick, NJ: Center for Urban Policy Research.

Grabowski, Richard. 1994. "Import Substitution, Export Promotion, and the State in Economic-development." *Journal of Developing Areas*, Vol. 28, p. 535-54.

Hoover, Edgar M. 1975. *An Introduction to Regional Economics*. New York: Alfred A. Knopf.

Huskey, Lee. 1987. "Import Substitution in Frontier Regions." Ch. 3 in *Developing America's Northern Frontier*, ed. Lane, Theodore. Lanham, Maryland: University Press of America.

Isard, Walter. 1956. *Location and Space Economy*. New York: John Willey & Sons.

Isserman, Andrew M. 2005. "In the National Interest: Defining Rural Correctly in Research and Policy." Forthcoming in International Regional Science Review, October 2005.

Krugman, Paul. 1995. Development, Geography, and Economic Theory. Cambridge, MA: The MIT Press.

Markusen, Ann R., Yong-Sook Lee, and Sean DiGiovanna (Ed.). 1999. *Second-Tier Cities: Rapid Growth beyond the Metropolis*. Minneapolis, MN: University of Minnesota Press.

Norton R.D. and J. Rees. 1979. The Product Cycle and the Spatial Decentralization of American Manufacturing. *Regional Studies*. 13:141-151.

Office of Management and Budget. 1998. "Alternative Approaches to Defining Metropolitan and Nonmetropolitan Areas," Federal Register, 63 (244): 70526-70561.

Office of Management and Budget. 2000. "Standards for Defining Metropolitan and Micropolitan Statistical Areas," Federal Register, 65 (249): 82228-82238.

Perroux, Francois. 1950. Economic Space, Theory and Application. *Quarterly Journal of Economics*. 64 (1): 89-104.

Perroux, Francois. 1988. "The Pole of Development's New Place in a General Theory of Economic Activity" in B. Higgins and D. Savoie (Eds.), Regional Economic Development: Essays in Honour of Francois Perroux. Boston: Unwin Hyman

Persky, J., Ranney, D., and Wiewel, W. 1993. "Import substitution and local economic-development." *Economic-development Quarterly*, Vol. 7, p. 18-29.

Polenske, Karen. 2001. "Competitive Advantage of Regional Internal and External Supply Chains." In *Regional Science Perspectives in Economic Analysis, Benjamin H. Stevens*, edited by Michael L. Lahr and Ronald E. Miller, Amsterdam, The Netherlands: Elsevier Science, B.V., pp. 259-284.

Polenske, Karen. 2003. Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies, *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhatten, Sweden.

Polenske, Karen. 2003. Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies, *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhaätten, Sweden.

Porter, Michael. 1996. "Competitive Advantage, Agglomeration Economies, and Regional Policy," *International Regional Science Review*, 19(1-2) (including comments by Ann Markusen and Porter's response): 85-94.

Ratcliffe, Michael. "Creating Metropolitan and Micropolitan Statistical Areas." http://srdc.msstate.edu/measuring/ratcliffe.pdf

Smirnov, Oleg, and Alena Smirnova. 2000. "An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia: A Report to the Appalachian Regional Commission." Appalachia Regional Commission.

United States Census Bureau. "About Metropolitan and Micropolitan Statistical Areas," http://www.census.gov/population/www/estimates/aboutmetro.html

US Census Bureau. "Metropolitan and Micropolitan Statistical Areas." http://www.census.gov/population/www/estimates/metroarea.html (accessed April 1, 2005).

Williams, Colin C. 1994. "Local sourcing initiatives in West Yorkshire: an evaluation of their effectiveness." Ch. 2 in *Reinventing a Region*, ed. Haughton, Graham and Whitney, David. Aldershot, United Kingdom: Avebury.

(C) Industry Agglomeration and Dispersal Economies

Bernard, A., Jensen, J.B., Schott, P.K. 'Assessing the Impact of Trade Liberalization on Import-Competing Industries in the Appalachian Region.' 2004.

Darwent D F, 1969, "Growth poles and growth centers in regional planning -- a review" *Environment and Planning A* **1**(1) 5–32

Feser, Edward, and Harvey Goldstein. August 2002. "Regional Technology Assets and Opportunities: The Geographic Clustering of High-Tech Industry," *Science and Innovation in Appalachia*.

Feser, E. J., Koo, J., Renski, H., and Sweeney, S. H. 2001. 'Incorporating spatial analysis in applied industry cluster studies.'

Flaherty, M. Therese. 1996. *Global Operations Management.* New York: McGraw-Hill Company.

Glasmeier, Amy K. and Jeff Kibler. 1996. "Power Shift: The Rising Control of Distributors and Retailers in the Supply Chain for Manufactured Goods," Urban Geography, Vol. 17, pp. 740-757.

Harrison, Bennett. 1992. *Industrial Districts: Old Wine in New Bottles.* Regional Studies. 26(5): 469-83.

Hoover, E. M. 1937. *Location Theory and the Shoe and Leather Industries*. Cambridge, MA: Harvard University Press.

Isard, Walter. 1956. *Location and Space Economy*. New York: John Willey & Sons.

Jack Faucett Associates and Economic Development Research Group. 2004. *Analysis of Global Competitiveness of Selected Industries and Clusters in the Appalachian Region,* prepared for the Appalachian Regional Commission.

Kotkin, J. (2000). *The New Geography: How the Digital Revolution is Reshaping the American Landscape*. New York: Random House.

Krugman, Paul. 1991. Increasing Returns and Economic Geography. *Journal of Political Economy*. 99(3): 483-499.

Landabaso, M, Oughton, C and Morgan, K (2001) 'Innovation Networks and Regional Policy in Europe', in Koschatzy, K, Kulicke, M and Zenker, A, *Innovation Networks: Concepts and Challenges in the European Perspective* , Physica-Verlag, Heidelberg and New York.

Li, Yu, and Karen R. Polenske. 2004. "Measuring Dispersal Economies". In *Entrepreneurship, Spatial Industrial Clusters and Inter-Firm Networks*. Trollhätten, Sweden: Universities of Trollhätten,/Uddevalla: 615-634

Polenske, Karen R. 2001. "Competitive Advantage of Regional Internal and External Supply Chains." *Regional Science Perspectives in Economic Analysis*. Edited by M.L. Lahr and R.E. Miller. New York: Elsevier.

Polenske, Karen R. 2003. "Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies," *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy.* Trollhaätten, Sweden.

Rosenfeld, Stuart A. 2001. "Networks and Clusters: The Yin and Yang of Rural Development. A report to the Federal Reserve Bank of Kansas City."

Teubal, Morris, Tamar Yinnon, and Ehud Zuscovitch. 1991. Networks and Market Creation. Research Policy. 20 (5): 381-392.

Weber, Alfred. 1909. Theory of the Location of Industries. English translation: Chicago: The University of Chicago Press, 1929.

(D) Natural and Cultural Asset-Based Development

Andersson,AÊ .E. 1985. "Creativity and Regional Development." Papers of the [Regional Science] Association, 56: 5–20.

Appalachian Regional Commission. 2004. "Appalachia: Turning Assets into Opportunities"

Asheim, Björn T. 1996. "Industrial Districts as "Learning Regions": A Conduction for Prosperity." European Planning Studies, 4(4): 379-400.

Broadberry, Stephen 1998 "How Did the United States and Germany Overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990" The Journal of Economic History Vol. 58, No. 2, pp. 375-407

Christian Science Monitor. 2004 "America's New Coal Rush." February 24. http://www.csmonitor.com/2004/0226/p01s04-sten.html

Destination Florida Commission. 2002. Destination Florida Commission's final report with recommendations, http://www.ccfj.net/DestFlaFinRep.html

Duncan, Cynthia M. 1992. "Persistent Poverty in Appalachia: Scarce Work and Rigid Stratification." in *Rural Poverty in America*, edited by Cynthia M. Duncan, Auburn House

Fingleton, Bernard, Danilo Igliori, Barry Moore, and Raakhi Odedra, forthcoming. "Employment Growth and Clusters Dynamics of Creative Industries in Great Britain." In *Geographies of Innovation*, edited by Karen R. Polenske, publisher being selected)

Global Philanthropy and Foundation Building, http://www.synergos.org/globalphilanthropy/02/abcdoverview.htm

Goldstein H., and C. Renault 2004. "Contributions of Universities to Regional Economic Development: A Quasi-experimental Approach." *Regional Studies: The Journal of the Regional Studies Association*, 38 (7): 733 –746.

Hall, Peter. 2000. "Creative Cities and Economic Development." *Urban Studies*,37(4): 639–649

Kusmin, Lorin, D. Kusmin, J.M. Redman, and David W. Sears. 1996. Factors Associated with Rural Economic Growth: Lessons from the 1980s. Economic Research Service, United States Department of Agriculture–TB 1850. USDA: Washington, DC.

Leff, N. H. 1979. Entrepreneurship and Economic Development: The Problem Revisited. *Journal of Economic Literature*, 17: 46-64.

Longino and Bradley. 2003. "A First Look at Retirement Migration Trends in 2000, *Gerontologist*" 43: 904-907.

Miernyk W. H., Shellhammer, K. L., Brown, D. M., Coccari, R. L., Gallagher, C. J., Wineman, W. H. *1970. Simulating Regional Economic Development*, Heath Lexington Books, D.C. Heath and Company, Lexington, Massachusetts.

Mytelka, Lynn K. 2001. "Mergers, Acquisitions, and Inter-firm Technology Agreements in the Global Learning Economy," In The *Globalizing Learning Economy*, edited by Daniele Archibugi and Bengt-Åke Lundvall. Oxford, England: Oxford University Press:127-14

OhUallachain, Breandan; Neil Reid. (1991) "The Location and Growth of Business and Professional Services in American Metropolitan Areas, 1976-1986." *Annals of the Association of American Geographers*, Vol. 81, No. 2, pp. 254-270.

Perroux, Francois. 1988. "The Pole of Development's New Place in a General Theory of Economic Activity" in B. Higgins and D. Savoie (Eds.), *Regional Economic Development: Essays in Honour of Francois Perroux*. Boston: Unwin Hyman

Polenske, Karen R. 2001. "Taking Advantage of a Region's Competitive Assets: An Asset-Based Regional Economic-Development Strategy." *Entrepreneurship, Firm Growth, and Regional Development in the New Economic Geography*. Trollhätten, Sweden: Uddevalla Symposium 2000: 527-544.

Power Daily. 2005. "Industry Veterans See Potential Repeat of Coal Boom and Bust Cycle", 25 February.

Pratt, A. C. 1997. The Cultural Industries Sector, Its Definition and Character from Secondary Sources on Employment and Trade, Britain 1984-91. *Research Papers on Environmental and Spatial Analysis* NO.41, London School of Economics

Reeder. R. J. 1998 "Retiree-Attraction Policies for Rural Development." Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agriculture Information Bulletin NO. 741.

Richmond Times-Dispatch, 2005. "National Geographic puts Appalachia on the Map," by Katherine Calos. March 22.

Riefler, Roger F. 1979. "Nineteenth-Century Urbanization Patterns in the United States." The *Journal of Economic History*. Vol. 39, No. 4

Schaffer, William A. 1998. A Survey of Regional Economic Models. Atlanta, GA: Georgia Institute of Technology: 48-83. http://www.rri.wvu.edu/WebBook/Schaffer/chap03.html#Heading25

Smirnov, Oleg, and Alena Smirnova. 2000. An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia: A Report to the Appalachian Regional Commission. Washington, DC: Appalachia Regional Commission.

United Nations Environment Program. 2002. "International Year of Ecotourism 2002"

Walker M., and Jourdan P. 2003. "Resource-based Sustainable Development: An Alternative Approach to Industrialisation in South Africa" *Minerals and Energy—Raw Materials Report*, Routledge, 18(3)

(E) Learning-Based Development

Artz, Georgianne: "Rural Brain Drain: Is it reality?" *Choices*, 4th Quarter 2003.

Barkley, David, Mark Henry, and Haizhen Li, "Does Human Capital Affect Rural Economic Growth? Evidence from the South," *The Role of Education, Mississippi State*, MS: Southern Rural Development Center, 2005.

Bellandi, 1988, p. 145

Bernat Jr, G. Andrew. "Clusters and Rural Labor markets," Bureau of Economic Analysis, U.S. Department of Commerce, Paper prepared for Southern Rural Labor Force Conference, October 1-2, 1998.

Brusco, Sebastiano. "Global Systems and Local Systems," *International Seminar on Local Systems of Small Firms and Job Creation*, Paris: Organization for Economic Cooperation and Development, June 1995.

Carnevale, Anthony, 1983

Carter, Ann. "Knowhow trading as economic exchange," Research Policy, 18 (1989), 155:163.

Clark, Peggy and Steven L. Dawson, *Jobs and the Urban Poor: Privately Initiated Sectoral Programs*, Washington, DC: The Aspen Institute. 1995.

Cooke, Phil and Nick Clifton, "Social Capital and Small and Medium Enterprise Performance in the United Kingdom," paper for workshop on Entrepreneurship in the Modern Space-Economy, Tinbergen Institute, Amsterdam, June 2002.

Coulombe, Serge, Jean-Francois Tremblay, and Sylvie Marchand, "International Adult Literacy Survey: Literacy scores, human capital and growth across fourteen OECD countries." (Ottawa: Statistics Canada, 2004).

Gibbs, Robert, Lorion Kusmin, and John Cromartrie, "Low-Skill Jobs: A Shrinking Share of the Rural Economy," *Amber Waves* 2 (Issue 5, 2003), Economic Research Service.

Green, Gary Paul. "Workforce Development Networks in Rural Areas of the United States," *SRDC Policy Series*. September 2003.

Haaga, John: *Educational Attainment in Appalachia*, (Washington, DC: Appalachian Regional Commission, May 2004).

Krugman, Paul *Geography and Trade*, (Cambridge: MIT Press, 1992).

Marshall, Alfred. *Principles of Economics*. Eighth Edition. London: Macmillan, 1936).

Maskell, Peter. "Towards a learning-based theory of the cluster," paper presented at the World Conference on Economic Geography, Singapore, December 2000.

Maskell, Peter "Knowledge creation and diffusion in geographic clusters," *International Journal of Innovation Management* 5 (2, 2001): 213-237

McGranahan, David: "Education and Rural Economic Development in the United States," in J Norman Reid and Sara Mazie (Eds) *Conceptual Frameworks for Understanding Rural Development,* A report funded by the Aspen Institute, USDA, University of Guelph, and the Arkleton Trust, 1994

Morgan, Kevin, "The Learning Region: Institutions, Innovation and Regional Renewal," *Regional Studies* 31.5 (19967) 491:503.

OECD, *Innovative Clusters: Drivers of Innovation Systems*, Paris: Organization for Economic Cooperation and Development, 2001.

Rosenfeld, Stuart, Ed Bergman, and Sarah Rubin, *After the Factories: Changing Employment Patterns in the Rural South*, (Research Triangle Park, NC: Southern Growth Policies Board, December 1986).

Rosenfeld, Stuart. *Shotgun Weddings, Open Marriages, and Quickie Divorces: An Analysis of Education and Local Development in the United States.* (Paris, France: Organization for Economic Cooperation and Development, 1980).

Rosenfeld, Stuart. "Does cooperation enhance competitiveness? Assessing the impacts of inter-firm collaboration," *Research Policy* 25(1996) 247:263

Ross, Peggy and Stuart Rosenfeld, "Human Resource Policies and Economic Development," in Rural Economic Development in *The 1980's: Prospects for the Future*, (Washington, DC: US Department of Agriculture, Rural Development Research Report Number 69, 1988.

Rupasingha, Anil, Thomas W. Ilvento, and David Freshwater, "Demand for Skills Training in the Rural South," Staff Paper 00-02, TVA Rural Studies Program (Lexington: University of Kentucky Department of Agricultural Economics, February 2000).

Saxenian, AnnaLee. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, (Cambridge: Harvard University Press, 1994).

Schuller, Tom. "Three Steps towards a learning society," *Studies in the Education of Adults* 30 (Ni. 1 April, 1998), 11:20.

Schultz, Theodor: *Investing in People: The Economics of Population Quality*, (Berkeley: University of California Press, 1981), p. 60.

Teixeira, Ruy: "Rural and Urban Manufacturing Workers: Similar Problems, Similar Challenges," *ERS Agricultural Information Bulletin* 736-02, January 1998.

Thurow, Lester> *Zero Sum Society: Distribution and the Possibilities for Economic Change*, (New York: Basic Books, 1980), p. 56

Von Hippel, Eric "Cooperation between rivals: Informal know-how trading," *Research Policy*, 16 (1987), 291:302.

3 IMPLICATIONS FOR RESEARCH AND PRACTICE

The background material presented in this volume represents just one small part of the Sources of Growth Study. However, the background research played an important role in defining the other parts of the study:

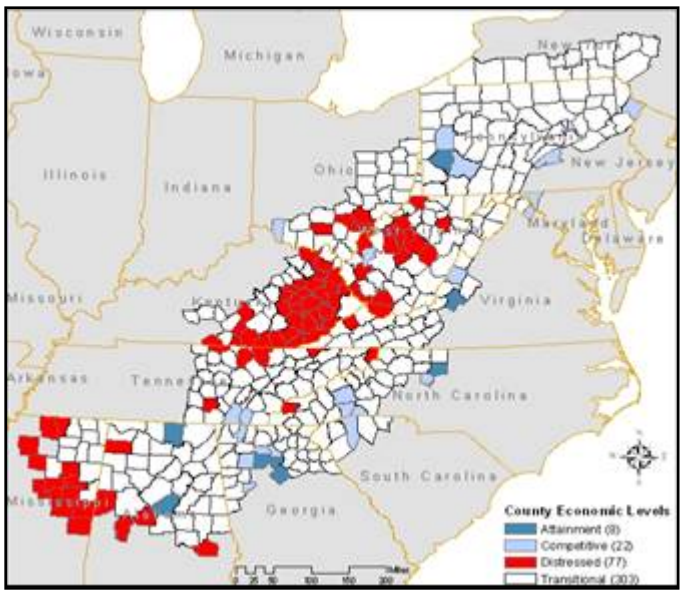
The discussion of theory and research (in chapter 2 of this volume) identified five key categories of economic development growth paths – asset-based development, learning-based development, manufacturing agglomeration growth, dispersed supply chain growth and trade center growth. Those categories guided the selection of case studies discussed in the separate Volume 2 document. The case studies provided examples of the complexities involved in pursuing each of the five major classes of growth path strategies. They also showed examples of the types of institutional and policy actions required for those strategies, and factors affecting their success.

The discussion of prior empirical research (in chapter 3 of this volume) also raised issues regarding the role of spatial location and access in affecting economic growth opportunities. This helped define the series of four research studies summarized in the separate Volume 3 document. Those statistical studies represent a step in a continuing process of research to further our understanding of the roles of spatial proximity to industry clusters and trade centers, the roles of transportation access improvements, and the impact of market scale on economic growth opportunities.

Finally, the classification of major growth paths (in this volume), together with the cast studies and additional statistical studies (discussed in separate volumes) together served to define a series of tools and measures that can be of practical use for economic developers seeking to better target economic growth and business attraction opportunities.

Sources of Regional Growth in Non-Metro Appalachia

Vol. 2. Case Studies of Local Economic Development Growth Processes



Prepared for the Appalachian Regional Commission

Prepared by:
Economic Development Research Group, Inc.
Regional Technology Strategies, Inc.

Revised 2007

SOURCES OF GROWTH PROJECT

The *Sources of Growth* project is part of a series of research efforts funded by the Appalachian Regional Commission to improve our understanding of factors affecting economic growth in rural and distressed areas. As stated in the Volume 1 Introduction, "the starting premise of this project is to go beyond the theory of comparative advantage to understand more concretely the multiple paths that an area can pursue in successfully enhancing job and income creation, and the effects of spatial linkages among communities in shaping these options. It is in this context that one can understand how communities may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. Furthermore, certain developmental path dependencies may shape the direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development." This research is intended to provide a basis of information that can ultimately be useful for enhancing the effectiveness of policies and tools aimed at improving the region's economic development.

This is Volume 2 in a series of reports prepared as part of this project:

- ***Executive Summary*** –synthesis of findings from all work products related to the study's four main research components.

- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties, classification of economic development growth paths, and a synopsis of white paper findings on theory relating to economic development growth paths.

- ***Volume 2, Case Studies of Local Economic Development Growth Processes*** – findings related to growth paths as observed for selected case studies covering manufacturing industry specialization clusters, supply chain-based development, tourism-based development, advanced technology development, and diversification from resource-based economies.

- ***Volume 3, Empirical Studies of Spatial Economic Relationships*** – findings from a series of econometric modeling and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.

- ***Volume 4, Tools for Economic Development & Study Conclusions*** – description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** – (A) Spatial Analysis of Economic Health, (B) Economic Analysis of Hub-Spoke Relationships, (C) White Papers on Economic Growth Theories, (D) Literature Review of Empirical Studies on Spatial Influences in Economic Development.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This volume was authored by Economic Development Research Group, Inc. (EDRG) and Regional Technology Strategies, Inc. (RTS). EDRG directed the overall research study and edited final documents. Staff of EDRG and RTS each developed half of the case studies.

Altogether, the Sources of Growth project involved a team of researchers including:

- Economic Development Research Group, Inc. (EDRG) – Lisa Petraglia (Project Director), Glen Weisbrod and Teresa Lynch, with research support from Tyler Comings and Brett Piercy;
- Regional Technology Strategies, Inc. (RTS) –Stuart Rosenfeld, Phil Psilos and Dan Broun;
- Massachusetts Institute of Technology, Department of Urban Studies & Planning (MIT-DUSP) – Prof. Karen R. Polenske, Prof. Joseph Ferreira, Jr., Ayman Ismail and Li Xin, with research support from Tan Zhijun, and Isabelle Yi Xu.

The project also benefited from the expertise of outside policy and research experts who reviewed various project documents, participated in meetings and provided technical guidance: Deb Markley (Co-Director of the Center for Rural Entrepreneurship, a Rural Policy Research Institute), Joseph Cortwright (Vice-President of Impresa Consulting), Ken Poole (Executive Director of ACCRA: The Council for Community and Economic Research), David Freshwater (Professor of Agricultural Economics and Public Policy at the University of Kentucky), David McGranahan and Luc Anselin (Professor. Dept. of Agriculture & Consumer Affairs and Regional Economics Applications Laboratory at the University of Illinois, Urbana- Champaign).

Overall project direction and oversight was provided by Dr. Greg Bischak of the Appalachian Regional Commission, whose wide range of research experience served to focus the project team on the development of policy applications. Important insight and suggestions were also provided by officials of the Appalachian Regional Commission who participated in a day-long symposium with the project team, including Thomas Hunter (executive director of ARC, Ann Pope (federal co-chair of ARC) and Rick Peltz (alternate federal co-chair). In addition, Ken Wester and Jason Wang of ARC assisted the project team in collecting and assembling transportation and geographic data.

Finally, the project team acknowledges the important role of prior ARC-funded research studies by Andrew Isserman, Ed Feser and Oleg Smirnov that provided a foundation for the work in Volume 3 this project to build upon.

1 INTRODUCTION

Overview. This volume presents six case studies of local economic development in Appalachia. The study areas range from single counties to multi-county regions. The case studies document the local context and history of economic development in these areas, in order to illuminate the processes of economic growth and change that have been and are occurring there.

All of the case studies focus on non-metro parts of Appalachia. They were selected to a range of locations and a range of economic growth paths, while also testing the usefulness of economic statistics and spatial linkages in illuminating the economic development situations actually occurring across the region.

Selection of Case Study Locations. Since the Appalachian region spans north, south, and central locations in the US it was desirable to have case study representation in each of these three major regions. Also of interest would be to examine how a previously resource dependent, which has seen its prospects diminish, made the transition to reorient their economy (such as leveraging cultural assets).

In addition to these two general priorities for case study definition and development, three specific outcomes from prior analysis studies were considered in identifying potential case study locations:

- Based on their analysis of trade centers and "hub-spoke" economic relationships between counties, Smirnov-Smirnova (2000) identified a sereies of Appalachian counties with "hub" potential and others with "spoke" potential. Case studies could illuminate how some of these areas have actually been performing as trade center hubs or feeders to them.

- Based on ARC's recent time-series comparison (1960 & 2005) of Appalachia's *distressed* counties, case studies focus on actions taken that helped some areas transition out of *distress.*

- Based on successful bids of two southern states to attract auto assembly plants, community stakeholders examine how economic development efforts have affected the extension of -chain and knowledge-based development processes into non-metro Appalachian counties.

The following six locations represent the final selection for undertaking case study regarding sources of growth:

- Scioto County, OH has been at the center of a ring of distress. It exhibits a services-oriented type of economy. While N-S highway improvements along US 23 have helped improve access to E-W traffic along US 50, the lack of an interstate has hampered Scioto development and the county has been slow to advance into the possible trade center (hub) role that Smirnov's analysis (2000) identified. The case study diagnoses the inertia and uncovers small positive steps now underway.

- Chautauqua County, NY has been maintaining its transitional status despite continued adverse forces tied to structural adjustments around U.S. manufacturing. Now attraction of jobs in transportation equipment manufacturing is serving to anchor the regional economy along with impetus of HUD Renewal Community status, various enterprise zones, and attempts to diversify/foster entrepreneurial development around tourism.

- Pike County, KY is the eastern-most county of a five county Local Development District that sits adjacent to the WV border. Pike County has managed to move from distressed to transitional status since 2003. However the four remaining counties in this mining-dependent LDD area have not faired the same. The case study explores reasons for Pike's gradual success, the stalled spillover to its neighboring counties and transferable lessons to other mining-dependent areas of Appalachia.

- Marion & Monongalia Counties, WV represent contrasts; Monongalia (home to Morgantown) is a metro county, while adjacent Marion County is a "micropolitan" area. Marion County had prior mining roots. This case study examines the development of a hi-tech initiative in these two counties with emphasis on the role of university-based research and commercialization and the extent to which Marion County is achieving diversification in its economy.

- SE Tennessee/SW North Carolina are covered by two adjacent Local Development Districts that are connected by Appalachian Highway Corridor K. The case study traces economic development efforts to develop cultural and recreation tourism along Corridor K between Chattanooga, TN and Asheville, NC.

- Alabama provides a state-level case study that traces how northern Alabama's automotive-related manufacturing activity (initiated by attracting Mercedes-Benz to Tuscaloosa, followed by auto parts suppliers) is raising the economic prospects in Appalachian AL.

Exhibit 1-1 below itemizes the case study locations, the research focus for each case study, its location, its ARC-rated economic status and the extent of urbanization.

Exhibit 1-1. Attributes of Case Study Areas

Case Study Area	Focus	Loc	Econ Status 2005	Type
1. Scioto County, Ohio	Potential economic hub (trade center) for services	N	Distressed	Micropolitan
2. Chautauqua County, NY	Manufacturing cluster diversification; Tourism development	N	Transitional	Micropolitan
3. E. Kentucky (Big Sandy Area)	Shift from mining, Medical technology; Trade center	C	Distressed	Rural
4. Monongalia and Marion, WV	Learning-based devel.; High tech complex,	C	Transitional	Micropolitan
5. SE Tennessee and SW North Carolina	Recreation-based amenity; Trade center	S	Transitional	Mixed
6. Alabama Auto Alley	Auto industry supply chain corridor	S	Mixed	Mixed

Collectively, these six case study areas span seven states. There are two case studies each in the northern (N), central (C) and southern (S) parts of Appalachia. Two are rated as substantially "distressed," while three are rated as "transitional" and the remaining one is a mix of those two classes. All are located primarily outside of metropolitan areas, though three feature micropolitan centers, one is completely rural and the other two have a mixture of rural and micropolitan settings.

The focus of these case studies covers all of the growth paths discussed in Volume 1, including trade centers, manufacturing and technology clusters (agglomerations), learning-based development, amenity-based development and supply chains. In addition, each case study addresses different examples of spatial linkages with neighboring communities and the role of metro and micropolitan areas.

Organization of Case Studies. Each case study is structured to present the following:

1) *Introduction* – explanation of why the case study was selected and the types of growth paths that it illustrates

2) *Profile* – brief description of the area's economy and its economic history:

- Composition of economy,
- Special features or assets;
- Labor markets: commuting, migration and education;
- Educational institutions: public and private schools; colleges, vocational training,
- Entrepreneurship: self-employed, startups, special services.

3) *Evolution of Progress* –how regional economy has been changing, related policy interventions and the effectiveness of strategies and actual outcomes:
   - History of interventions, basis for economy, changes over time, business recruitments and closures, supplier development,
   - Plans and strategies: types of plans and/or visions that were pursued
   - Degree to which any of the place-specific assets have been exploited
   - Resources: previous federal grants, subsidies, local foundations, etc.

4) *Catalysts of Change* – the organizational structures and technical changes that support collaboration:
   - Social capital: civic infrastructure, associations, non-profits, local leadership, education, external linkages;
   - Physical infrastructure: transportation, broadband and utility enhancement
   - Politics: strength and interest of state and federal representatives, political access, funding and tax policy
   - External factors: globalization, logistics technology advances

5) *Lessons Learned* –findings that can be useful for application elsewhere:
   - Flexibility in response to unforeseen changes;
   - Role of key players and institutions in leading change.

6) *Interviewees* – credits to business and economic development representatives who were interviewed (Note: all findings are interpretations of the report authors and not the responsibility of interviewees.)

2 SCIOTO COUNTY, OH: *REBUILDING AN ECONOMIC ENGINE*

2.1 Introduction

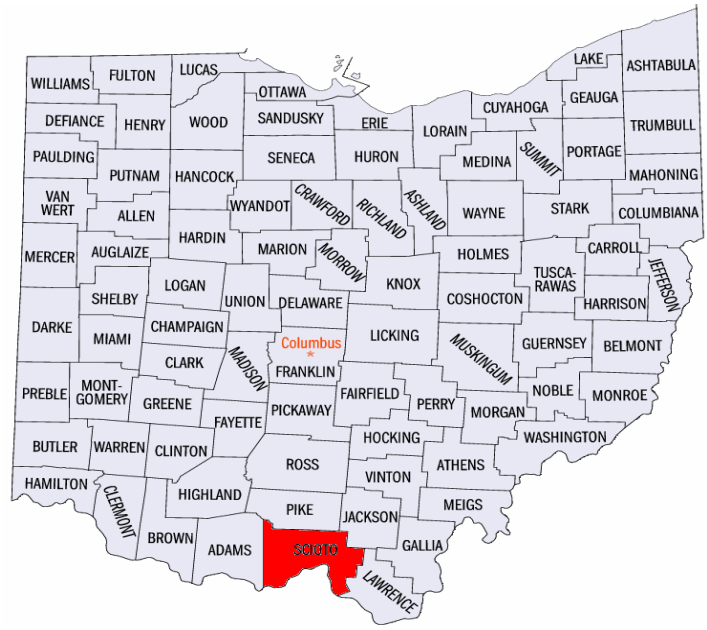
Scioto County, OH has been at the center of a ring of distress. It exhibits a services-oriented type of economy. While N-S highway access improvements to US 23 have mitigated some of the effects of being bypassed by the interstate system Scioto County has been slow to advance into the possible trade center (hub) role that Smirnov's analysis (2000) identified. The case study diagnoses the inertia and uncovers positive steps now underway.

In the last half of the 20th century, Scioto County, Ohio went from being an industrial powerhouse to a community struggling to meet the challenges of the new economy. However, some recent up-ticks in growth suggest that the county is showing signs of progress as it adjusts to a new economic reality. Significantly, while neighboring Ohio counties have remained classified as distressed by the Appalachian Regional Commission, Scioto recently moved to a transitional designation. In addition, some spatial analysis suggests that the county could serve as a regional hub for surrounding counties, drawing outside consumers to the county for the purchase of goods and services. In addition, Scioto County has moved from a community heavily dependent on manufacturing to one in which services play a prominent role.

2.2 Regional Profile

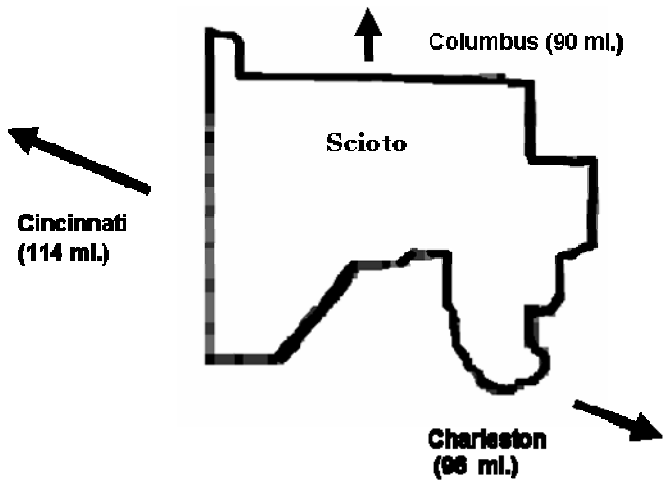
Setting. Scioto County, population 79,195, sits in the far southern part of Ohio, just across the river from Kentucky. It is almost equidistant from the large metropolitan areas of Cincinnati and Columbus and about 45 minutes from Huntington, West Virginia, a mid-sized city. The county seat of Scioto is Portsmouth, which, with 20,909 residents, is also by far the largest city in the county. (See Exhibits 2-1,2,3.)

Exhibit 2-1 Scioto's Location Within Ohio



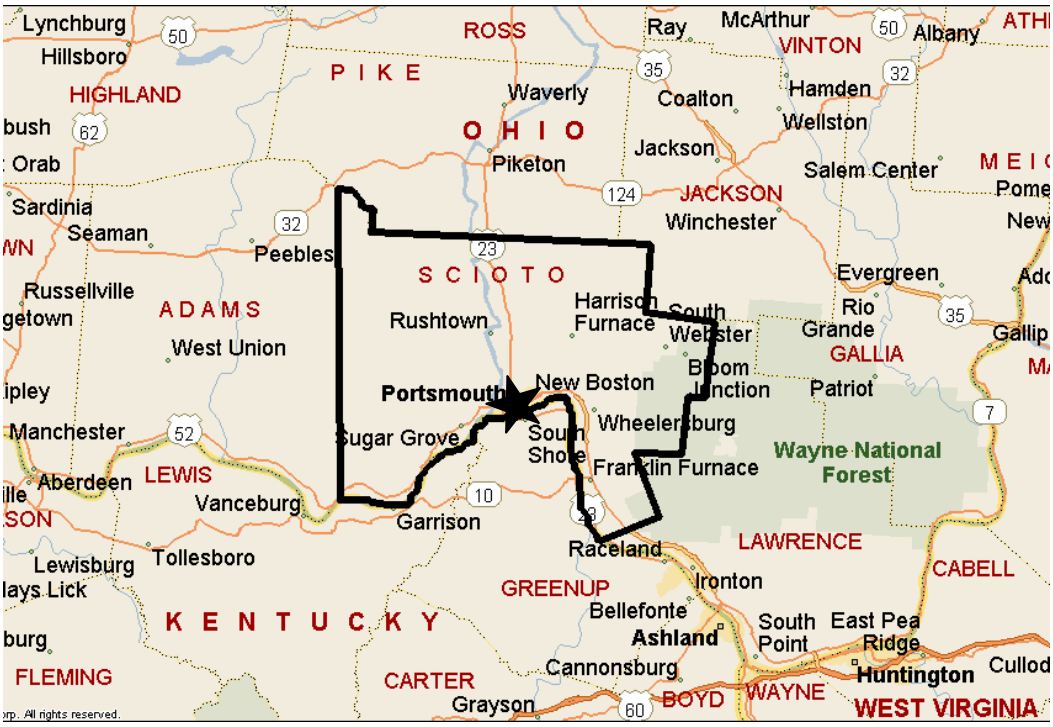
Source: FedStats.

Exhibit 2-2. Distance from Scioto County to Surrounding Metropolitan Cities



Source: Microsoft Streets and Trips

Exhibit 2-3. Scioto County - Detail Map



The county has been steadily losing population, with a decline of 1.4% between 2000 and 1990 (Exhibit 2-4). This is in comparison to the rest of Appalachian Ohio, which enjoyed a modest population growth of six percent over the same time period. Scioto County also has a smaller population than it did in 1950, declining by 4.5% since that date.

Exhibit 2-4. Population Growth, 1970-2000

	Population				% Change			
Population	**1970**	**1980**	**1990**	**2000**	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**
Scioto County	76,951	84,545	80,327	79,195	9.9%	-5.0%	-1.4%	2.9%
State of Ohio	10,652,017	10,495,445	10,847,115	11,353,140	-1.5%	3.4%	4.7%	6.6%

Source: US Census Bureau and EDR Group calculations.

Economic Overview. The stagnant or negative growth in the county can be directly traced to the changing economy of the region. For most of its history, the county was dependent on manufacturing. The county, and Portsmouth specifically, were seen as attractive places to locate and operate industry. Access to transportation was the driving factor in much of the industry location. With a location on the Ohio River, industry had easy access to transport their goods and receive important supplies like

coal. As railroads became more important, the presence of an extensive rail network became beneficial for the county.

Foremost in the development of the county in the first half of the 20th century was the steel industry. The community served as a focal point for the industry as Ohio took its place as a center of the national steel industry. As the industry declined due to globalization and mechanization so did the fortunes of the industry in Scioto County. By the early 1980s, the last steel manufacturer had left the county.

The county's other manufacturing industries suffered similar fates. For instance, Portsmouth had been a focal point for the shoe manufacturing industry in the US. But by the 1990s, there were basically no shoe manufacturers left in the US, much less in Scioto County. While the county remains the home to Mitchellace Inc., the only shoelace manufacturer in the country, the production of actual shoes has long ended. The production of bricks also ended leaving the county without a real export driven economic base.

The decline of Scioto County's manufacturing base is partly due to the fact that the particular sectors that the county specialized in were ones most vulnerable nationally. The county also suffered from a changing transportation environment. While the county once could rely on its prime access to the Ohio River and rail access to promote industrial advancement, it began to suffer as the highway became the economic driver. As one local resident put it:

"First there was the river, and Scioto County thrived. Then there was the railroad and Scioto County thrived. Then came the interstate and Scioto County died."

Scioto County does not have an interstate within its borders and while the region's best four lane North-South corridor US 23 has improved access to the East-West route of US 50 just north of Scioto, there are still accessibility issues, particularly with the bypass being built on the east side of the county. So due to both a general decline in its once prominent industries and a changing infrastructure environment, Scioto County no longer can be seen as a county whose economy is manufacturing dependent.

Currently, 7.6 percent of the county's workforce is employed in manufacturing. Instead, in a story similar to most of the country, the areas of economic specialization in the county are in the service industries. Exhibit 2-5 shows the percentage of county employment in various sectors.

Exhibit 2-5. Percentage of Scioto County by Sector

Industry	Percent of Total Employment
Government & non NAICs	16.5%
Food services & drinking places	8.7%
Ambulatory health care	7.1%
Admin support services	6.6%
Hospitals	6.6%
Construction	6.2%
Nursing & residential care	4.8%
Social assistance	3.2%
Professional- scientific & tech svcs	2.5%
Primary metal mfg	2.3%

Source: IMPLAN data derived from BEA, 2002.

The large percentage of Scioto County employment in the health care and social assistance sector is borne out in looking more closely at location quotients for the county. Examining sectors at a more detailed NAICS code reveals areas in which the county appears to have specialization relative to the United States as a whole. Exhibit 2-6 shows the sectors in the county that have a location quotient greater than 1.2 and have more than 500 employees. (Note a location quotient above 1.2 means that the industry sector has a representation in the local area that is 20% or more above the national average for that industry.)

Exhibit 2-6. Location Quotients of Scioto County Sectors

Description	Number of Employees	Location Quotient
Primary metal manufacturing	707	7.8
Nursing & residential care	1,449	2.8
Hospitals	2,001	2.8
Ambulatory health care	2,162	2.1
Social assistance	970	1.7
Food svcs & drinking places	2,653	1.4
General merch stores	688	1.3
Admin support svcs	2,013	1.2
Government & non NAICs	5,022	1.2
Food & beverage stores	676	1.2

Source: IMPLAN data derived from BEA, 2002.

As the above chart shows, with the exception of primary metal manufacturing, Scioto County's comparative strengths lie in retail and services. The concentration of employment in such sectors as food services and food stores would suggest that Scioto County might serve as a hub for these activities. In addition, health care shows up as

being an industry in which the local economy has a high concentration. Hospitals, nursing and residential care, and ambulatory care all have extremely high location quotients.

The center of Scioto County's health care industry is Southern Ohio Medical Center (SOMC) in Portsmouth. SOMC is the largest medical center in Ohio, south of Columbus. It employs 2,100, making it the largest employer in the County. Later in this study, we will discuss the role that SOMC plays and could potentially play in the growth of the County.

2.3 Evolution of Progress

Economic Attainment. One reason for choosing Scioto County as a case study was its movement in economic status between ARC's distressed and transitional categories. Exhibit 2-7 shows Scioto's oscillation in economic status using the ARC categories of economic performance. The recent change in status can be attributed to the fact that Scioto's three-year unemployment rate for 2001-2003, while relatively high at 7.8 percent, was just below the critical ARC distressed threshold of 150 percent of the national unemployment rate during the three-year period of measurement.

Exhibit 2-7. Scioto's ARC Economic Status

Period	ARC Economic Attainment level
1988-1992	Transitional
1993-2004	Distressed
2005-2006	Transitional

Trade Center (Hub) Status. Another reason for choosing Scioto County as a case study was an earlier economic base study by Smirnov and Smirnova (2000), in which Scioto County was classified as a "Type 1 County" – one with both "a strong economic-base" and "strong local spatial linkages," suggesting a likely regional trade center. That analysis of the industrial mix of the Scioto and surrounding counties concluded that residents and business in the more rural surrounding counties could be expected to utilize businesses in Scioto County.

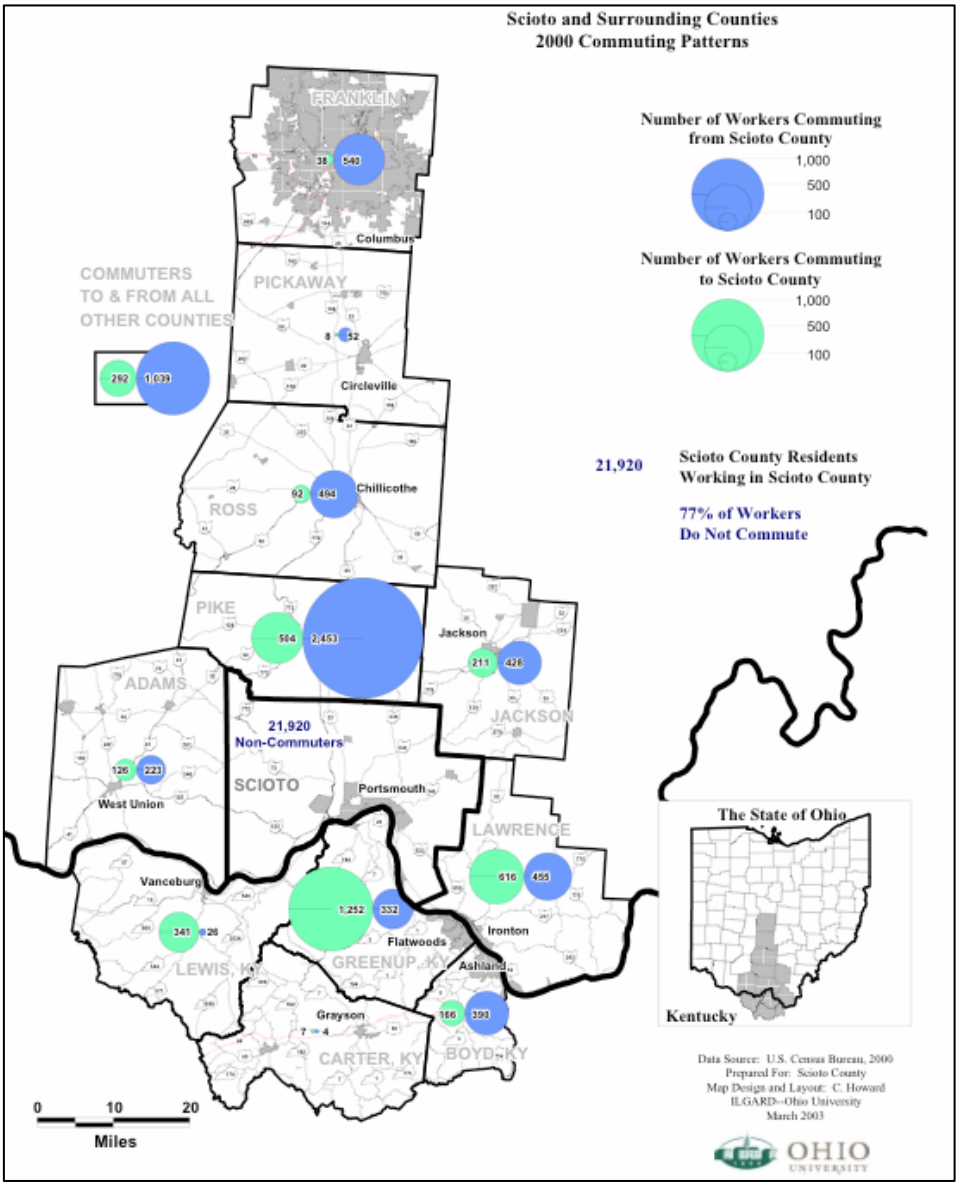
Further analysis, both quantitative and qualitative, indicated that despite the statistical suggestions that Scioto could serve as a regional hub, the reality is far different. Indeed, representatives from the Ohio Regional Development Commission saw surrounding counties such as Ross and Pike (both transitional counties) as more the regional centers than Scioto, although they believe the county has strong growth potential. Community leaders within Scioto also doubted the county's current ability to serve as a regional hub, several calling Portsmouth " a typical Wal-Mart Town," offering little beyond that store as an attraction to those living outside. "We were once

a hub, but we are no longer," said one community leader. "People go to Ashland (WV) or Huntington (KY) for their services, especially retail."

Scioto County's failure to serve as a regional hub manifests itself in several ways, as described in the following pages.

Commuting patterns. If it were a true regional hub, Scioto County could be expected to draw workers to its firms on a daily basis. In fact, as Exhibit 2-8 shows, Scioto is actually a net exporter of workers, with about 2,700 employees commuting on a daily basis. Indeed the only county in which Scioto appears to out commute to is Greenup County, Kentucky, which lies just across the Ohio River.

Exhibit 2-8. Scioto County Area Commuting Patterns



Retail patterns. If Scioto County operated as a true regional hub, it would be expected that residents of surrounding counties would migrate to the area to satisfy their retail needs such as shopping and eating. The location quotients of retail establishments shown earlier in Exhibit 2-6 also suggest that the county is drawing individuals from surrounding counties. But it appears that this is more of a statistical quirk than any real proof that Scioto County or Portsmouth is acting as a regional hub. Indeed, most leaders and residents interviewed for the study reported that residents of the county were more likely to drive to other areas for destination shopping and dining.

The main reason for Scioto County's inability to attract retail customers is one of location. As shown earlier in Exhibit 2-2, Scioto is actually at the center of a set of counties that have much better metropolitan access. For instance, Pike County, to the north of Scioto, would be more likely drawn into the metropolitan sphere of Columbus. Similarly, Adams County, to the west, is drawn into Cincinnati's service area. In addition, Scioto County does not have any large retail establishment such as a mall to draw shoppers. In fact, most interviewed residents of Scioto County themselves shopped at malls in Ashland, Kentucky or Huntington, West Virginia for their needs.

Supplier-customer relationships. While retail and commuting patterns are critical, the interchange between businesses is even more important to an economy. If a county's businesses draw their customers from surrounding locales, then they can be seen to serve as a regional hub. In the case of Scioto County that does not appear to be the case. The manufacturing firms that remain in Scioto County export their products on a national or larger regional basis than just surrounding counties. For example, Mitchellace in Portsmouth has a large contract with Kiwi, a company not located in Ohio.

There is a small concentration of financial and other professional services but these tend to be more focused on the local market. Portsmouth is home to seven banks, five of which are nationally chartered. Again. conversations with local officials suggest that these banks do not draw heavily from surrounding companies but instead serve the relatively large Portsmouth market.

One "industry" that does appear to attract regional usage is higher education. Portsmouth is home to Shawnee State University, a four-year institution that also offers two-year associate degrees. The university draws both students and employees from surrounding counties. For instance, 71 percent of Pike county residents who attend a four-year public university attend Shawnee State University. The university also employs a large number of employees who cross the bridge from Kentucky. The role of Shawnee State is discussed later in this paper.

2.4 Catalysts of Change

Responding to Growth Challenges. There are three areas of economic emphasis that merit closer examination. Each one of these categories represent ways in which Scioto County, either through intentional government intervention or through market forces, is attempting to grow its economy. This section of the paper examines:

The Health Care Industry

Higher Education

Manufacturing

For each of these categories, the ways in which growth is manifesting itself is discussed as well as the challenges pursuing such a strategy may pose to Scioto County. In addition, this section includes a discussion of how economic development agencies in the county and region are working to improve Scioto County.

Health Care. As mentioned, Scioto County enjoys a high concentration of employment in the health care industry. While there are substantial numbers of private doctors' offices, clinics and health care homes, the prime driver of this sector is Southern Ohio Medical Center located in Portsmouth. Located in Portsmouth, SOMC employs nearly 2,100 doctors, nurses and associated staff. The main hospital has more than 400 beds and the center owns several other health care offices and programs in the county. The hospital's growth has been in part facilitated by a commitment to make SOMC a high-tech medical center. In the last few years, SOMC has added a cancer treatment facility as well as a cardiac care center. All told, the hospital has undergone $70 million in expansion in recent years. SOMC took its current form in 1986, when several local health care facilities merged. The hospital operates as a non-profit entity. SOMC's impact on the economy comes primarily through direct employment. Doctor's offices in the area can affiliate themselves with the hospital and at least seven do so.

A major factor in the growth of the industry is the graying population of Scioto County. According to the 2000 Census, 14.9 percent of Scioto County's residents are over 65 compared to 12.4 percent of the national average. The population is expected to get even older proportionally—31percent of the population is over 50 compared to 27% of the US total. And SOMC is clearly geared to the local market: more than 80 percent of patients come from Scioto County with the rest from surrounding counties including some from Kentucky.

The population served by SOMC does present a problem for the hospital as a true economic growth strategy. The payer mix of the population is extremely dependent on government-assisted patients. Fully 75% of the patients use government insurance to pay for their services. This dependence reduces income for the hospital, as the hospital estimates it only collects a small portion of each dollar charged to these payers.

One plus for the hospital has been its ability to attract and retain nurses and other staff. While rural locations can sometimes hurt hospitals, administrators report an extremely high retention rate. SOMC offers generous benefits including offering 100 percent tuition reimbursement for staff or their spouses to go back to school to become nurses.

In addition to paying for school for staff, one of the reasons for the ability to attract employees are quality educational programs available locally. Shawnee State in particular provides a good source of nurses to SOMC. Students in the program are comfortable with Scioto County and are pleased with the opportunity to pursue employment in that area.

Unfortunately attracting doctors to the area has been extremely difficult for SOMC. In a story repeated all over Rural America, SOMC relies heavily on foreign doctors who travel to the US on special visas or domestic doctors who are able to work off heir medical school loans by working in an economically disadvantaged regions. In either case, doctors that do come do not tend to stay long. Administrators report that the problem in keeping and attracting doctors tends to have more to with these personnel's families comfort level with the community. Families often complain about the lack of cultural and shopping amenities. The results can often result in delays in implementing the high-tech facilities that the center rightly prides itself on. For instance, hospital administrators report that the state of the art cancer facility sat unused for a full year before doctors could be attracted to the site.

To make up for the difficulty in attracting doctors, SOMC relies on different strategies. One is using osteopaths to perform many tasks. The hospital maintains a strong working relationship with Ohio University in Athens and their college of Osteopathic Medicine. This relationship allows graduates of that institution to provide a pipeline of qualified practitioners who understand life in small town Appalachian Ohio and who are committed to staying and working in a community such as Portsmouth.

While the hospital is growing and continued expansion plans are in the work, there are limits to using SOMC, and indeed health care as an economic growth strategy. There is heavy competition in the region for medical services, and while SOMC is the largest facility in the surrounding counties, it is not the only one. Adena Health Systems in Pike County draws significant numbers of patients. In addition, for specialized medical care, patients are likely to journey to national medical centers in Cleveland and Cincinnati. Staff estimate that 70 percent of the "heart market" leaves the county. The fact that 80 percent of patients at SOMC come from Scioto suggests that new money is not being brought into the county.

Higher Education. Shawnee State is clearly an institution that has the potential to impact the growth of Scioto County. Founded as a community college, Shawnee State became a university in 1986. The college has 3,800 students and college offers both four year degrees and associate degrees, making an interesting hybrid of a community college and a university. As a university, Shawnee State is increasing the numbers of

students who live on campus. Currently, nearly 500 students a year reside in campus housing and plans are in the works to expand these numbers.

The college possesses several especially strong programs. Of special import to Scioto's "new" economy, is a strong allied health curriculum. As mentioned, Shawnee State provides a significant number of the nurses to SOMC and the hospital and the university have close relationships. In addition to offering traditional programs, Shawnee State also innovative programs that are drawing national attention. For instance, the university offers one of the nation's only programs in gaming. This program trains students in creating and marketing video games. The program attracts students not only from around Ohio but from states all around the country.

Shawnee State does represent one area where the notion of Scioto County serving as a hub is a reality. Exhibit 2-9 shows the percentage of college students from neighboring counties who attend Shawnee State. As it shows, Shawnee is by far the preferred destination for students in these counties.

Exhibit 2-9. OH Public University Attendance at Shawnee State

Scioto	80.1%
Pike	70.8%
Adams	61.7%
Lawrence	27.9%
Jackson	26.4%
Ross	15.2%
Gallia	14.5%

The university not only welcomes these students it, like many universities, is an engine of innovation. Several companies have spun out of activities at the university. For example, Yost Engineering, one of the most successful firms in the County, was founded by a former professor at Shawnee State. In addition to this spin off potential, the college offers training to companies in the area in a variety of areas including:

Management and Human resources training

Customer service

Office skills such as using Microsoft programs

A targeted industry program providing training for 201 employees in the 2004-5 school year. Training was delivered at companies such as Mitchellace, Inc.

Sun Coke and Scioto Plastics.

The university has made an impact in the cultural life of the community as a hole. The university is responsible for the Verne Riffe Center for the Arts, a 1,140-seat performing arts center on campus. The Center brings national musical and performing

arts to the area. These amenities are critical in attracting and just as important retaining families and young people to the area.

Using Shawnee State as a growth strategy, however, is not without its problems. Foremost among these is the fact that Portsmouth is not structured right now as a traditional college town, or certainly not one that can cater to a large residential population. Several local officials and residents pointed out the lack of typical college student hangouts as just one example of how Portsmouth lacked amenities that could serve students and benefit from the dollars that they often spend. For instance, there is not a pizza place or a college-focused bar within walking distance of campus.

Some individuals interviewed doubted whether or not Portsmouth really even wants to be a "college town. "They don't want to be an Oxford, Ohio. They don't want to be an Athens, Ohio."

There recently have been heated battles over the location of student housing, suggesting that not all county residents are comfortable with embracing a residential student population in the area.

Manufacturing: Returning to Scioto County's Roots. While Scioto County's industrial mix has changed dramatically, leaders in the community have not abandoned what once was the heart of the region's economy: a strong manufacturing base. Several steps have been taken to encourage the location of new industry in the county and making sure that companies that remain can prosper.

The prime example of the community's focus is the effort to redevelop a plot of land to host Sun Coke, Inc., a large steel manufacturer. Through grants through an empowerment zone project, Scioto County worked to turn a brownfield site into an area that could host an industry that provided good, high paying jobs. The site is not only home to Sun Coke but is the future home of large retail establishments such as a "big box" (e.g. Wal-Mart).

A key in the location of Sun Coke was a regional approach to securing land for the facility. For example, Ohio Valley Regional Development Corporation gave Scioto County funds to provide sewer access for the plant. And although the plant was located in the small municipality of Franklin Furnace, representatives from communities throughout the county were involved in the development of the project.

Indeed, regional cooperation is key to much of the manufacturing development that is occurring in the area. Another prime example is the focus on a facility in neighboring Pike County. Pike County as home to a large uranium enrichment plant that employed hundreds of workers, the majority of whom came from Scioto County. Community leaders in a variety of counties are cooperating through an organization called the Southern Ohio Development Initiative (SODI), to devise ways to turn this brownfield into a viable industrial site. Recently, USEC, Inc. announced plans to build a large centrifuge plant that will employ more than 500 workers, providing opportunities for

workers throughout the region, including Scioto County. Although the workers will not be employed within the county limits, the presence of a qualified workforce in Scioto County was critical to the decision to build the facility.

A qualified and experienced manufacturing employment base is a strength of Scioto County. Sun Coke, for instance, reported that they were very pleased with the quality of employees that came to their facility once they opened. Other manufacturing firms may also be attracted by this strong cadre of qualified individuals when making site selection decisions.

Another strength that Scioto County has tried to capitalize on is its continued access to rail and river transportation. Industries that rely on these two transportation modes could be drawn to the county to do business. However, according to the director of the port authority, significant improvement to the system of dams and locks along the river need to be made to take full advantage of the river's potential draw.

A more critical barrier to large-scale industrial/manufacturing growth is the lack of free engineering space. "We don't have 200 acres to show people," one community leader said, saying that brownfield redevelopment as in the case of Sun Coke, is the only real place that manufacturing firms can be expected to open new facilities. The reason for the lack of new development space has more to do with geography than an unwillingness to open land for development. The county is extremely hilly and the presence of two rivers (the Scioto and Ohio) means much available space lies in flood plains. Some available land is owned by Norfolk and Southern which is reluctant to sell the land unless a company that is extremely rail dependent would be willing to purchase the land.

Formal intervention. Scioto County is fortunate to have a number of economic development organizations that are committed to its growth. Foremost among these is the Ohio Valley Regional Development Commission (OVRDC), the local development district, headquartered across the border in Pike County. OVRDC continues to work closely with local officials to see how more industry and commerce can be attracted to the county. For instance, OVRDC provided funding to the County to make infrastructure improvements to ensure that Sun Coke would come to the region.

The Commission is not alone in trying to promote Scioto as part of a regional renaissance. SODI, mentioned in the previous section, is an example of an organization that is looking for regional solutions to vexing problems facing the county. Perhaps the greatest cooperation among economic development players came through the enterprise zone/empowerment zone project in the New Boston Area. As discussed, the project brought together a wide range of community leaders to help convert what previously was a Brownfield site into one that can attract industry. Leaders in several counties help build a small business incubator in Pike County that is utilized by residents from Scioto County. In addition, the Southern Ohio Growth Partnership acts as a regional chamber of commerce, serving businesses within a 30

mile radius of Portsmouth.

Indeed, much of the formal economic development efforts underway concentrate on both ensuring that existing manufacturing can prosper and helping to attract new businesses to the area. In terms of attracting new businesses, area leaders recognize the importance of helping firms compete in an era dependent on information exchange. The Scioto County Economic Development Office is active in HighTech Ohio, an initiative that highlights information and technology based companies in the county.

While these efforts at improving Scioto County are impressive, there is not a comprehensive economic development strategy in place for the county that stresses a single economic sector or set of sectors. Rather efforts are made to make sure that the county continues to adjust as it moves away from being solely dependent on manufacturing to an economy that depends more heavily on the health care and educational sectors.

2.5 Lessons Learned

Scioto County represents an interesting model for those Appalachian counties that are struggling to reinvent themselves. In this case, Scioto County is trying to emerge from an economic downturn related to the loss of manufacturing jobs, particularly in the steel industry. Several lessons emerge for counties facing similar challenges.

Switching to a service-based economy is difficult. Scioto County's economic future is increasingly tied into the service-based industries—particularly health care and higher education. Any community attempting to refocus itself will encounter difficulties. One of the main challenges is in providing a workforce that is equipped to handle this change in direction. Those trained in working in a manufacturing plant can't necessarily turn on a dime to work in a hospital or university. Often service jobs pay less than do manufacturing which means that the average wage in Scioto County may not grow as vibrantly as once expected. Creating better paying service jobs are a challenge but one that needs to be explored. Certainly Shawnee State's strong allied health education program is one way to steer residents into higher paying medical professions.

Manufacturing should not be ignored. Of course, Scioto County recognizes that concentrating solely on service industries is problematic. These types of businesses, as mentioned, pay lower wages and bring less outside money into a community. Thus, Scioto County has tried, when possible, to ensure that the County's strong manufacturing base is not ignored. Programs such as the Sun Coke project and the regional cooperation around the former uranium enrichment plant allow the County to keep a foothold in manufacturing.

Build upon existing assets. Scioto County recognizes that although it has undergone

significant economic distress it does have something going for it. Foremost among these are access to rail and river transport. County leaders recognize that while the role of the Ohio River may not be what it once was, for certain industries it remains a critical component of trade. Industrial recruitment efforts promote the area's river access—something that could draw more heavy industry to the county.

The County is also recognizing that the more modern transportation choice of road access is a continued problem for the County. Accordingly, leaders are pushing for a by-pass that would provide better four-lane access through the County. The belief is that this will encourage development in the County and perhaps increase the County's ability to attract consumers from neighboring areas. The proposal is not without its detractors of course. In particular, those who want to see a rebirth of downtown businesses worry that a bypass on the outskirts of town would further cripple retail traffic downtown.

Creating a regional hub is problematic. This case study began with the hypothesis that Scioto County served as a regional hub for its neighbors. Ground truthing that belief revealed that the County does not draw significant business, consumers or workers from surrounding counties. The county faces special challenges due to the relative proximity of larger urban centers, which border Scioto County's neighbors. This siphoning of periphery demand from an older, limited scale core economy to a larger, extra-regional metro area is an example of adverse spillover effect. Improved transportation access at the periphery and emanating away from the core facilitates this economic displacement. It is perhaps unrealistic to believe that Portsmouth could draw individuals away from the bright lights of Columbus or Cincinnati. What Scioto County can do, and has in many cases, is to make sure that it retains the local market within the county. For instance, SOMC 's expansion goals are to capture as much of the Scioto County patient population as possible. The cancer center at SOMC was put into place because more than 75 percent of cancer patients in Scioto County were traveling elsewhere for treatment.

In any case Scioto County is looking regionally for solutions through cooperation with the Ohio Valley Regional Development Commission and other economic development entities in the area. Other efforts include an active program that promotes better internet access in Appalachian Ohio, a shared incubator space, and continued cooperation around the uranium enrichment plant. The leaders in the county recognize that if the County is truly to be reborn it is going to take more than just the residents of Scioto County it will take regional cooperation and linkages with Appalachian Ohio.

2.6 Interviewees

- Elizabeth Blevins, Community Relations Director, Southern Ohio Medical Center
- Steve Carter, Director, Scioto County Economic Development Office

- Craig Gilliand, Administrative Director of Financial Support and Facilities, Southern Ohio Medical Center
- Jason Gillow, Research/Planning Supervisor, Ohio Valley Regional Development Commission
- Steve Gregory, Office of Career Services, Shawnee State University
- Jennifer Hanlon, Director of Community Development, City of Portsmouth,

Sondra Hash, Managed Care Manager, Southern Ohio Medical Center

John Hemmings, Assistant Director, Ohio Valley Regional Development Commission

- Robert Huff, President, Southern Ohio Growth Partnership
- Jim Kalb, Mayor, City of Portsmouth

Virginia Moore, Director University Outreach Services, Shawnee State University

Greg Simonton, Executive Director, Southern Ohio Diversification Initiative

Jeff Spencer, Executive Director, Ohio Valley Regional Development Commission

Bob Walton, Director, Scioto County Community Action Program/ Southern Ohio Port Authority

Susan Warsaw, Director of Development, Shawnee State University

3 CHAUTAUQUA COUNTY, NY: *MANUFACTURING DIVERSIFICATION*

3.1 Introduction

Chautauqua County, NY has been maintaining its transitional status despite continued adverse forces tied to structural adjustments in U.S. manufacturing. Attraction of jobs in transportation equipment manufacturing is now serving to anchor the regional economy along with impetus of HUD Renewal Community status, various enterprise zones, and attempts to diversify/foster entrepreneurial development around tourism.

Chautauqua County presents an interesting case study as a region in transition. For much of the twentieth century, a strong manufacturing sector that relied on an established transportation network, a well-trained blue collar workforce, and the county's natural resources defined the region's economy. Over the past twenty years, the manufacturing sector has declined sharply as a result of global competition, changing consumer tastes, and technological advances. In the face of significant job loss in the manufacturing sector, the County has transitioned, with some success, to a more diversified economy. It retained some of its manufacturing base through specialization and targeted economic development programs, and successfully expanded its base to include a growing tourist industry characterized by expansion in the service and retail sectors. The lessons learned by the County and its strategies for addressing its changing economy offer useful insights for other regions in Appalachia.

3.2 Regional Profile

Chautauqua County is located in far western New York State, directly south of Buffalo. It is bordered by Lake Erie and Pennsylvania to the west and Pennsylvania to the south. It is part of the Southern Tier West planning area along with the counties of Allegany and Cattaraugus. The county encompasses 1,062 square miles Exhibit 3-1.

Exhibit 3-1 Chautauqua County's Location Within New York State

Chautauqua is a rural county, with a population density of 131.6 persons per square mile. As shown in Exhibit 3-2, , the U.S. Census reports that 139,750 people lived in the County in 2000, a decrease of 5.1% since 1970. In comparison, New York State's population increased by 4.1 percent over the same period. Census estimates for 2003 indicate a continued decline in population of Chautauqua County to 137,645. Jamestown, with a population of approximately 31,000 people, is the County's largest city. Dunkirk, located on the shores of Lake Erie, had a population of 13,131 in 2000 and is the County's only other city. The remainder of the County includes 27 towns and 15 villages. The Jamestown-Dunkirk-Fredonia area is the region's designated micropolitan area. The region's business and industry is concentrated around its two cities. Farmland and forests characterize much of the remainder of the County.

Exhibit 3-2 Population Change, 1970-2000 - Chautauqua Co. and NY State

	Population				% Change			
Population	**1970**	**1980**	**1990**	**2000**	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**
Chautauqua County	147,205	146,925	141,895	139,750	-0.2%	-3.4%	-1.5%	-5.1%
New York State	18,236,967	17,558,072	17,990,455	18,976,457	-3.7%	2.5%	5.5%	4.1%

Source: US Census Bureau.

Historically, the geography, climate, and natural resources of Chautauqua County have shaped its economy. For over two hundred years, the rich soils have supported farming, and the microclimate along Lake Erie have proven ideal for growing grapes. The agricultural and viticulture industries in turn spawned a robust food processing industry in the County. The region boasts large areas of hard wood forests that have

supported the development of both wood products and furniture manufacturing industries. The primary and fabricated metals industries grew up along the Lake Erie Coast where the Great Lakes shipping lanes and rail road lines provided cheap and easy transportation access to the automobile manufacturing centers in Michigan. Tool and dye, machinery, and transportation equipment manufacturers located in the area to both support the metals industries and to have easy access to their products.

These manufacturing industries remain important to the economic health of Chautauqua County, although the region has struggled in the face of plant closures and employment contractions. Exhibit 3-3 shows that manufacturing employment represented 31.3 percent of all jobs in the County in 1970. While manufacturing still accounts for 19.3 percent of the County's employment, manufacturing jobs declined by over 24 percent between 1970 and 2000.

Exhibit 3-3 Employment Change by Industry, Chautauqua County, 1970-2000

	1970		1980	1990	2000	
EMPLOYMENT		**% of Tot.**				**% of Tot.**
Farm employment	3,070	5.1%	3,470	2,890	2,460	3.3%
Agricultural Services	280	0.5%	440	680	830	1.1%
Mining	30	0.1%	540	510	280	0.4%
Construction	2,290	3.8%	2,220	3,180	3,010	4.1%
Manufacturing	18,770	31.3%	18,120	15,400	14,190	19.3%
Transportation, Comm., PU	2,640	4.4%	2,320	2,460	2,840	3.9%
Wholesale Trade	1,830	3.1%	2,610	2,440	2,340	3.2%
Retail Trade	9,570	16.0%	10,290	12,780	13,240	18.0%
FIRE	3,710	6.2%	3,920	2,860	3,200	4.3%
Services	8,280	13.8%	13,190	17,730	21,100	28.6%
Government	9,480	15.8%	10,270	10,530	10,220	13.9%
Total	59,950	100.0%	67,390	71,460	73,710	100.0%

% CHANGE	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**	**1980-2000**
Farm employment	13.0%	-16.7%	-14.9%	-19.9%	-29.1%
Agricultural Services	57.1%	54.5%	22.1%	196.4%	88.6%
Mining	1700.0%	-5.6%	-45.1%	833.3%	-48.1%
Construction	-3.1%	43.2%	-5.3%	31.4%	35.6%
Manufacturing	-3.5%	-15.0%	-7.9%	-24.4%	-21.7%
Transportation, Comm., PU	-12.1%	6.0%	15.4%	7.6%	22.4%
Wholesale Trade	42.6%	-6.5%	-4.1%	27.9%	-10.3%
Retail Trade	7.5%	24.2%	3.6%	38.3%	28.7%
FIRE	5.7%	-27.0%	11.9%	-13.7%	-18.4%
Services	59.3%	34.4%	19.0%	154.8%	60.0%
Government	8.3%	2.5%	-2.9%	7.8%	-0.5%
Total	12.4%	6.0%	3.1%	23.0%	9.4%

Source: CEDDS Volume II, 2002 Woods and Poole Economics, Inc.; EDR Group

Exhibit 3-4 displays the industry mix (location quotients) by industry for Chautauqua County compared to both New York State and the nation. The location quotients confirm that the region retains a concentration of manufacturing jobs, particularly in the food processing, furniture, fabricated metals, and machinery manufacturing categories. The continued viability of these industries in the County has been dictated by their ability to adapt to global competition; the availability of a well-trained, loyal workforce; and efforts by the economic development community to provide assistance and incentives. Some have faired better than others.

As the manufacturing sector has struggled and lost employment, the tourism industry has expanded in the County. The County's bucolic landscape and natural features such as Lake Chautauqua have helped attract visitors, as have successful efforts to develop destination attractions within the County. Growth in the tourism sector has helped mitigate job loss in manufacturing, and in recent years, the economic development community has recognized that tourism can provide an alternative source of job growth for the workforce.

3.3 Evolution of Progress

Despite contractions in important manufacturing sectors, the county has had some success reinforcing existing industries such as primary and fabricated metals, transportation equipment, food processing and wood products. The region is also beginning to look to recreation and tourism assets to further diversify its economy.

Manufacturing

Primary and Fabricated Metals. The fabricated metals industry dominated the economy of Chautauqua County communities such as Dunkirk for several decades in the mid-1900s. Proximity to Detroit's auto manufacturers provided by cheap water and rail transportation supported the development of the steel and related industries all along the shores of Lake Erie.

Beginning in the early 1980s, international competition and resistance to the strong union workforce led to a sharp decline in the metals industries. Several businesses contracted or closed, including Roblin Steel and Alumax Extrusions. Empire Specialty Steel (formerly Al Tech Steel), which was once employed 800 people and was one of the largest steel manufacturers in the County, closed its doors in 2001 after several years of decline. Employment in the primary metals industry declined by 25.2 percent between 1997 and 2002, while employment in the fabricated metals sector declined by 2.4 percent over the same time period. Reductions in these industries, and the impact of these reductions on the County's local tool and dye and machinery manufacturers, account for a large percentage of the decline in the manufacturing sector in recent decades.

Exhibit 3-4. Industry Mix – Chautauqua County Compared with the State & U.S.

		Location Quotient	
NAICS	Sector	Chautauqua NY State	Chautauqua US
111	Crop Production	73	16
112	Animal Production	38	25
113	Forestry & Logging	32	12
114	Fishing, Hunting & Trapping	00	03
115	Support for Agriculture & Forestry	11	02
211	Oil & Gas Extraction	467	73
212-213	Mining & Support Activities	32	06
221	Utilities	11	13
230	Construction	08	06
311	Food Products	76	45
312	Beverage & Tobacco Products	32	18
313	Textile Mills	00	03
314	Textile Product Mills	00	06
315	Apparel Manufacturing	00	01
316	Leather & Allied Products	00	03
321	Wood Products	41	13
322	Paper Manufacturing	00	03
323	Printing & Related Support Activities	07	06
324	Petroleum & Coal Products	56	18
325	Chemical Manufacturing	04	05
326	Plastics & Rubber Products	11	06
327	Nonmetallic Mineral Products	29	18
331	Primary Metal Manufacturing	22	13
332	Fabricated Metal Products	71	45
333	Machinery Manufacturing	47	37
334	Computer & Electronic Products	00	01
335	Electric Equipment, Appliances, etc.	00	03
336	Transportation Equipment	32	11
337	Furniture & Related Products	198	104
339	Miscellaneous Manufacturing	04	05
420	Wholesale Trade	07	07
441-454	Retail Trade	13	11
481-487	Transportation	10	09
491-493	Mail, package delivery & warehousing	05	05
511	Publishing Industries (except Internet)	06	09
512	Motion Picture & Sound Recording	00	03
515	Broadcasting	08	09
516	Internet & data process srvs	00	01
521-522	Monetary, Financial, & Credit Activity	03	06
524	Insurance Carriers & Related Activities	03	03
525	Funds, Trusts, & Other Financial Vehicles	00	03
531	Real Estate	02	03
532	Rental & Leasing Services	13	09
533	Lessors of Nonfinancial Intangible Assets	00	03
541-551	Professional/Scientific, Technical, Services	04	06
561	Administrative & Support Services	05	06
562	Waste Management & Remediation	09	08
611	Educational Services	01	02
621-624	Health Care & Social Services	10	13
711-713	Amusement & Recreation	13	17
721-722	Accommodations, Eating & Drinking	15	13
811-812	Repair, Maintenance, & Personal Services	08	07
813	Religious, Civic, Professional, Organizations	15	31
814	Private Households	03	03
920	Government & non NAICs	08	08

Source: EDR-LEAP (with IMPLAN data) and EDR Group.

Despite the sharp decline in the metals industries, both the private and public sectors remain determined to retain these important components of the economic base. After the closure of Empire Specialty Steel, the state took possession of the facility and worked diligently with the local economic development community to find a buyer for the plant. In 2002, Universal Steel, a Pennsylvania-based company purchased the facility, and opened Dunkirk Specialty Steel on the site. The firm streamlined production, hired 100 employees, and is now producing steel in Dunkirk, although at a much reduced level. Some additional metal fabricators have managed to remain in operation in Chautauqua County by identifying specialty markets such as galvanized rebar. Dawson Metals, a locally owned firm, has developed a niche making steel doors for clients including the Mayo Clinic and US Senate. Another manufacturer has developed a specialty market producing metal door handles. In 2002, the fabricated metals industry still accounted for four percent of the County's employment (2,645 jobs), making it the fifth largest employment sector in the region (see Exhibit 3-5).

Exhibit 3-5. Top Five Employment Sectors in Chautauqua County, 2002

	Rank	Employment
Government and non NAICs	1	7,149
Food Services/Drinking Estabs	2	4,874
Religious - grantmaking/Similar	3	3,707
Food Products	4	2,783
Fabricated Metals	5	2,645

Source: MIT-DUSP Economic-base Analysis Update

Transportation Equipment. The transportation equipment industry in Chautauqua has managed to remain viable, primarily as a result of continued expansion at two major employers. Cummins, Inc., an international manufacturer of diesel engines, consolidated its mid-west operations in 2002, shutting its plant in Indiana and expanding employment at its Lakeville site. The firm is now the fifth largest employer in the County with 1,020 employees, and is expected to increase employment to 1,250 before the expansion is completed. The firm chose to expand operations in Jamestown because of the well-trained workforce, low energy rates ($0.04 per kilowatt hour) available through the municipal utility (the remainder of the County's energy is provided by a private firm, and is more than double the cost of competing regions), and tax incentives available through the Greater Jamestown Empire Zone.

Truck-Lite Co., Inc., a manufacturer of vehicle safety lighting, opened in Jamestown 50 years ago. The firm, which is now a subsidiary of Penske, retains it headquarters and a manufacturing plant in Chautauqua County, in addition to several plants throughout the world. The firm has 550 employees in Chautauqua County. The

quality of the workforce and good union relationship are two important reasons why the firm remains in the County. It is located in the Greater Jamestown Empire Zone and has taken advantage of the employee tax credits available through the Empire Zone as it has expanded. Because of expansion at these two facilities, employment in the transportation equipment sector increased by 3.4 percent between 1997 and 2002.

Food Processing. The County retains a strong food processing industry in the northern part of the County, even though today much of the raw product used in it manufacturing facilities is imported from out of state or abroad. The ability to quickly ship produce around the world for processing, as well as wage competition from other regions have created challenges for the food processing industry in Chautauqua. Kraft Foods closed its Chautauqua Operation, and within the past year, Welch's significantly reduced its operations at its two facilities in the County. Despite these challenges, employment in the food products industry grew by 5 percent between 1997 and 2002. Two off-label food processing companies, the locally-owned Cliffstar Corporation (635 employees) and the nationally-owned Carriage House Companies (793 employees) anchor these sectors in the County, producing products such as juice, ketchup, and peanut butter. The presence of these two off-label manufacturers proved important during the recent national economic downturn, as consumers increase their purchases of lower priced off-label goods when the economy falters.

Other major food processors include Fieldbrook Foods (400 employees locally), the second largest producer of ice cream on the east coast. Fieldbrook Foods bought out the locally-owned Dunkirk Ice Cream Company in 1996. Another major food processing firm in the northern part of the region is Nestle Purina PetCare Company (270 local employees), which manufactures pet food in the Dunkirk area. Nestle Purina recently completed a $90 million expansion of its operations, and purchased more than 50 acres of land to accommodated future expansion plans. The Empire State Development Corporation has given a large grant to the firm to finance an electrical substation to reduce energy costs.

In 1999, the County Industrial Development Agency invested in four industrial parks, including the Chadwick Bay Park in the Dunkirk-Sheridan Empire Zone. The County developed a spec building in the Park aimed at attracting businesses that support the food processing industry. In 2002, Grafco PET Packaging Technologies, which manufactures containers and bottles for the food processing industry, built a 120,000 square foot manufacturing facility in the Chadwick Bay Industrial Park in close proximity to the existing food manufacturers. The firm located in Dunkirk to "better serve its northeastern and Canadian markets" and because of the well-trained workforce. The plant supplies both Carriage House and Cliffstar. The plant employs over 300 people. The economic development community believes that Grafco will be an important factor in retaining and growing the region's food processing industry.

Wood Products. The southern part of the County around Jamestown is noted for its hardwood forests, which supported vibrant wood products and furniture industries for many years. The wood products industry has faltered in recent years, decreasing

employment by 5.1 percent between 1997 and 2002. The decline in the County's wood products industry is a result of changes in consumer tastes and competition from other regions with cheaper labor costs. Today, much of the high end furniture market, which once used the high quality hardwoods grown in Chautauqua County, now uses exotic woods from Asia and South America. Less expensive furniture is now manufactured using laminates and lesser quality woods grown elsewhere.

Although the County's furniture industry has faced strong competition from abroad (particularly Asia and the southern United States) and the closure of several plants including two Ethan Allen facilities, employment in the furniture and related products manufacturing sector has managed to remain stable (+0.8% between 1997 and 2002). The industry employs 2,783 people (4.2 percent of all jobs), ranking fourth among Chautauqua County industries. The importance of this industry to the region is underscored by its 19.16 location quotient compared to New York State, and 11.46 compared to the nation.

To compete, the County's furniture manufacturers have developed niche markets. Bush Industries has moved away from using the high quality woods grown in the region to manufacturing pieces made from composites. The firm, which opened in Jamestown in 1959, is the third-largest employer in the County, with 1,249 employees in 2005. The firm has branch plants in several locations around the world. The locally-owned Crawford Furniture manufactures reproduction pieces in the Stickley style. Greco, a national firm, makes baby furniture, and Cold Craft manufactures conference furniture. The ability to identify and create specialty products has helped the furniture sector survive in the County, although according to the region's economic development professionals, the industry continues to struggles to remain competitive.

The decline in manufacturing employment in the County has certainly raised concerns about the economic future of the region. In particular, many of the jobs lost were in strongly unionized sectors that provided good wages for a skilled workforce. However, the ability of the County to retain and attract some new firms in its traditional industries through specialization and streamlining provides some encouragement that the region can maintain, through creative approaches and targeted economic development programs, a solid manufacturing sector.

Tourism. Chautauqua County has mitigated job loss in the manufacturing sector through diversification into other sectors. In 1970, the service sector accounted for 13.8 percent of jobs in the County, and retail jobs made up 16 percent of the employment base. In 2000, these industries accounted for 28.6 percent and 18 percent of the County's jobs, respectively. Food service and drinking establishments employed 4,874 people in 2002, ranking it second among employment sectors in the County. The strength of the retail and service sectors is attributable to growth in the tourism industry, which has tapped the region's natural resources, landscape, and history create destinations and activities to attract tourists.

The cornerstone of the County's tourist attractions is the world-renowned Chautauqua

Institution (CI), founded in 1874 as a religious retreat on Lake Chautauqua. The CI is a unique community built on 750 acres of land. The gated community includes 1,200 properties, including 300 year-round residents, hundreds of summer homes, a 160 room hotel, and a 5,500 capacity amphitheater. Home values within the gates have soared and have anchored an escalating interest in summer homes in Chautauqua County. The CI is currently expanded, purchasing several acres of land adjacent to the facility and adding 32 housing lots. The Institution's nine-week summer season features over 2,000 programs including lectures, theater, opera, symphonies, and other activities, which attract over 150,000 visitors (both day trippers and overnight guests) to the region. The CI is currently seeking to expand its draw beyond the summer season by marketing the facility for conferences, reunions and other events.

The Peek'n Peak Resort and Conference Center is a four season destination that includes two golf courses and 27 trails of downhill and cross country skiing. Visitors come from surrounding states and Canada to use these facilities. The resort recently constructed 150 condominiums on-site. Golf Digest recently recognized the region as an outstanding golfing destination. Snowmobile clubs in the County also help promote winter tourism by maintaining hundreds of miles of trails, and summer tourist activities include fishing in Lake Erie and Chautauqua Lake**.** The grape growers and wine producers have developed a "wine trail" along Routes 5 and 20 near Lake Erie, which attracts visitors from surrounding states and Canada. The region is also attracting cyclists because of its rolling hills, scenic landscape and roads with wide shoulders.

Chautauqua Lake has long drawn visitors from outside the County, including Ohio, Pennsylvania and Ontario. Attractions have included Bemus Point amusement park and numerous beaches along the shores of the Lake. The Lily Dale Assembly, a spiritual retreat on the eastern shores of the Lake attracts several thousand visitors during the summer. In recent years, interest in second homes around the Lake has increased, with real estate values increasing at a fast pace. The economic potential of the Lake area as a tourist attraction is demonstrated by the interest of at least one outside investor, who has purchased and opened four restaurants in the past few years.

Attractions have also been built around the reputations of the region's famous sons and daughters. Jamestown houses the Lucille Ball-Desi Arnaz Center and Museum, and hosts two Lucy-Desi festivals each year. The Roger Tory Peterson Institution of Natural History, the Robert Jackson Center, and the Fenton History Center also celebrate the lives and legacies of famous Jamestonians. Other attractions in Jamestown include the recently-completed ice arena, funded by the Gebbie Foundation. The arena successfully hosted the junior national ice skating championships in 2004, and expects to draw additional competitions in the future. A Best Western Hotel is under construction adjacent to the arena.

The interest of the region's economic development community in growing its tourism industry has emerged in recent years. Jamestown currently is preparing a downtown urban design plan that will recommend the city pursue the development of a tourist

attraction that can attract up to 100,000 people per year. The city is developing its river-walk, and has applied for federal transportation funds to redevelop its train station. In the Dunkirk area, an investor is promoting the creation of the Lake Erie Heritage Museum, focusing on the shipwrecks that have occurred on the lake throughout its history. In addition, the tourism industry is currently developing an agricultural trail that will highlight area farmers' markets, seasonal farm stands, and the County's maple syrup producers. After many years of ignoring the industry, the County government now provides funds to the Chautauqua County Visitors' Bureau for marketing and development.

Two recent changes are expected to heighten the appeal of Chautauqua County as a tourist destination. First, the upgrade of the Appalachian Development Highway corridor T (also known as US 17 and designated as I-86 in the upgraded sections) to Interstate standards has dramatically improved access to the region. Although some businesses expressed concern that these improvements would simply facilitate the exodus of people from Chautauqua to shopping destinations in tax free Pennsylvania, there are indications that the highway is helping to bring more people to the County for recreation. There are two new hotels in Jamestown near the highway interchange, and representatives of the tourist industry report that visitation to the County's attractions is increasing. The tourism community would also like to utilize the two rest areas along the Interstate to better promote the region's attractions.

Second, swayed by considerable lobbying by the Chautauqua County Chamber of Commerce, the County legislature voted this year to allow the County to abolish its sales tax, reducing the overall sales tax from 8.5 percent to 4.5 percent. Retailers and economic development professionals anticipate that this reduction will help dissuade residents from leaving the County to shop in Pennsylvania.

Industry-setting Labor Markets. Because manufacturing dominated the economy of Chautauqua County for so many years, the region developed a highly skilled blue collar workforce with a strong work ethic. Despite the decline in manufacturing jobs, a blue collar "culture" continues to dominate the workforce. Many families have passed down to their children the expectation that they will work in manufacturing, a goal which has become harder to achieve as the sector has declined. Additionally, the earning potential of the blue collar workforce has decreased as manufacturing firms have been forced to cut wages to remain competitive in the global marketplace, and jobs in the tourism industry typically pay lower wages than manufacturing jobs.

Prior to the decline of the metals industries, Chautauqua County was known as a strong union area. Today, the strength of the unions has declined, as is evidenced by the $10/hour wages offered at the newly opened Dunkirk Specialty Steel. Some economic development professionals believe that the history of union activity in Chautauqua and the proximity of the region to Buffalo, a once-strong union town, continue to hinder the County's ability to attract new firms. The County's economic development community often tries to downplay its proximity to Buffalo when courting new manufacturers to the region.

In 2000, 91,261 Chautauqua County residents were over the age of 25, and the labor force participation rate was 61.4 percent. Just over eighty-one percent of the labor force had at least a high school education, compared to 45.6 percent in 1970. The percentage of the labor force with a four-year college education increased from 7.5 percent in 1970 to 16.9 percent in 2000. Comparatively, 27.4 percent of the New York State workforce has at least a four-year college education.

Chautauqua County suffers significant out-migration of its young, working age population. According to researchers at the Center for Rural Regional Development and Governance at the State University of New York at Fredonia (SUNY-Fredonia), young people between the ages of 15 and 29 account for more than 50 percent of the out-migration from the three counties that make up the southern tier west area of New York State. Further, the 2000 US Census reports that the Jamestown-Dunkirk-Fredonia Micropolitan Statistical Area suffered the highest rate of out-migration of young, single, educated people (-344.8) in New York State. This compares to a state out-migration rate for this population group of -11.3. Economic development professionals report that the out-migration is particularly pronounced for the college educated population, and while many businesses can find skilled workers for factory jobs, they report difficulty filling vacancies for professional-level jobs.

The Chautauqua County workforce primarily works within the County. The average travel time to work is 18.4 minutes, compared to a nation average of 25.5 minutes.

Entrepreneurship. Economic development professionals in Chautauqua County indicated that there is some entrepreneurial activity in the County, but that success is limited. Those who are successful generally are professionals who have identified a specialty niche market, and spin off from a larger manufacturing establishment. There is also a growing number of people who grew up in the region returning to Chautauqua County to raise families. A small number of these people have developed internet-based businesses that allow them to effectively serve their clients from a location in Chautauqua County. However, entrepreneurship is not a major contributor to economic growth in the region.

The success of entrepreneurial activity in the County can be measured by the ratios of the number of proprietors in the County to the number of wage and salaried worker, and the income of proprietors to wage and salaried workers, as well as changes in these ratios over time. Exhibit 3-6 shows that the ratio of proprietors to wage and salaried workers in Chautauqua County in 2003 was 0.238, a 6.9 percent increase since 1998. However, the ratio of non-farm proprietor income to wage and salaried employee income was only 0.083, and this ratio declined by 31.9 percent between 1998 and 2003. These data indicate that while the number of people employed as proprietors is increasing, the income of these proprietors relative to the rest of the work force is declining. Further, the wages of proprietors in 2003 was considerably lower than that of wage and salaried employees. These trends suggest that, overall, entrepreneurial activity in Chautauqua County is not occurring in response to

perceived opportunities for economic growth, but instead people are becoming self-employed due to necessity (such as job loss.)

Exhibit 3-6. Entrepreneurial Activity - Chautauqua County, New York

Indicator of Entrepreneurial Activity	Ratio/%
Ratio of N-F Proprietors Income/Wages - 2003	0.883
Change in ratio of N-F Proprietors Income/Wages (1998-2003)	-31.3%
Ratio of Proprietors Emp/W&S Workers 2003	0.238
Change in Ratio of Proprietors Emp/W&S Emp (1998-2003)	6.3%
Proprietor Employment Growth, 1998-2003	2.3%

Source: EDR Group calculations and REIS data.

Educational Institutions. The County's three institutions of higher education also play a role in promoting and supporting economic growth. The State University of New York at Fredonia has a reputation for high academic standards. The university regularly partners with the business community and public sector to provide technical assistance and improve the business climate in the County. The Center for Regional Development and Governance was created eight years ago to provide assistance to the 26 cities and towns in the County on ways to reduce the cost of government as well as the cost to do business in the County. The Center has been involved with the strategic planning study in Jamestown, and an evaluation of the impacts on Dunkirk's tax base of allowing the NRG power station to provide a payment in lieu of taxes (PILOT) to the city of Dunkirk. The Center recently developed a masters degree program in accounting program to help serve the needs of Chautauqua County businesses. A computer science program is under development to help attract high technology firms to the area, and the Center is exploring the creation of an MBA program.

The University has been working with the Dunkirk-Sheridan Empire Zone for the past five years on an effort to create a high technology incubator in Dunkirk. The university recently earmarked $5 million to be used for the construction of the incubator, although operating funding is still being sought. Supporters are currently defining the target market for the facility. One niche under consideration is computer-based food technology applications that can support the food processing industry. The University is already involved with a project to evaluate opportunities for technology transfer between the University and the food processing industry.

Jamestown Community College offers two-year liberal arts associates degrees. Many of the College's students transfer to four-year colleges after graduation. The College also offers technical and career programs, and part-time study programs for job skill and cultural enrichment. The college has grown from an enrollment of 169 students at

the local high school to over 4,000 students at multiple campuses in the Southern Tier region. Local businesses work with the college to design job training programs specific to their individual business needs. The Manufacturing Technical Center at the College provides training for high technology and machinery industries in the County, and works with businesses to develop courses specific to their needs.

Jamestown Business College offers associate degrees and certificate programs in a variety of business fields. The College offers coursework in marketing and management, information technology, entrepreneurship, accounting, and medical and legal fields.

3.4 Catalysts of Change

Prior to the 1980s, the people of Chautauqua County proudly identified their region as a manufacturing stronghold. For the most part, the region's economic development efforts were aimed at supporting the manufacturing sector. The region boasted a workforce well-trained to serve the region's metals, food processing, furniture, and related industries. Businesses prospered, employment and wages increased, and the economy grew.

In the 1980s, regions within the United States and abroad began courting manufacturers with a lower wage work force, lower energy costs, and favorable tax structures. Chautauqua County found itself significantly handicapped by the high union wages that predominated, energy costs more than double other areas of the Country, and the notoriously high corporate, employee, and income tax rates in New York State. Further, innovations in shipping allowed for perishable items to be transported internationally, and reduced the costs of shipping bulky items overseas, thus improving the ability of foreign firms to serve American markets. Next day air services produced options for quickly delivering parts, equipment and products to markets around the world. Some analysts have suggested that environmental regulations within the United States increased manufacturing costs in the states relative to off-shore locations, although the evidence is mixed. In the 1980s, many analysts argued that while overseas companies eagerly adopted new production methods and innovations that produced high quality products more cheaply, American manufacturers failed to do so.

Many if no all of these factors may have contributed to the decline of the manufacturing sector in Chautauqua County. Because the County's identity was so closely tied to manufacturing, the workforce, business community, and government were all slow to respond to the structural shifts occurring in the economy. Instead, the region expanded efforts to retain the existing economic base rather than exploring opportunities to diversify and change. Further, significant competition existed between the northern and southern parts of the county, as well as between individual jurisdictions. The various organizations working to grow the economy operated

individually, and often in competition with each other to attract businesses. According to several economic development professionals in the region, the region needed to suffer through the considerable economic upheaval of the 1980s and 1990s before it was ready to embrace economic change and work together as a region to diversify and grow the economy.

Today, the County has recast its image from being predominantly a manufacturing center. After years of refusing to acknowledge that tourism and service-based businesses could provide an important component of an economic development strategy, the economic development community has now embraced tourism as central the region's future growth. The community also is reevaluating its assets to identify additional areas for growth and development, such as the development of a distribution center in Ripley, where Interstates 79, 90, and 86 converge. Furthermore, the business and economic development communities have moved from a territorial approach to economic development to embrace a team approach to economic growth. Strong leaders have emerged from both the business and public sectors to provide a strong voice for change both at home and in Albany. These changes in attitude and strategy form the basis of the County's successful transformation to a more diversified, stable economy.

A Strong Framework for Economic Development

As Chautauqua County's economy contracted over the past twenty years, the number and strength of economic development organizations in the County has increased. Furthermore, these organizations have dropped parochial attitudes and come together to attract businesses to the region instead of competing among themselves to attract firms. Collaborations include:

- A partnership between the County Industrial Development Agency, the City of Jamestown, the two Empire Zones, the for-profit Buffalo Niagara Enterprise (responsible for business attraction and marketing), the Westfield Development Corporation, and the Workforce Investment Board. This group meets regularly to discuss strategies for business retention and growth.
- The consolidation of the North county and South County Chambers of Commerce into a single Chamber representing the entire County.
- The participation of the Chamber in the Committee for the Future, a super-regional group of business and public sector leaders representing Chautauqua, Cattaraugus, Allegany, and Munroe Counties.
- A partnership between the four Empire Zones in the Southern Tier Region, facilitating the sharing of leads and information.

The strength of these local efforts at collaboration have been rewarded with state and federal programs and grants aimed at stabilizing the economy in light of losses in the manufacturing sector. Organizations involved in economic development range from super regional organizations to local community development agencies to business

organizations and private foundations. Some of the most active organizations involved in economic development in the County and their roles are described below.

- The **Southern Tier West Regional Planning and Development Board (STWRPDB)** provides economic development assistance to Chautauqua, Cattaraugus and Allegany Counties. This regional agency produces the annual Regional Economic Development Strategy, which is funded by the US Department of Commerce Economic Development Agency (EDA), and the Appalachian Regional Commission (ARC). The document includes an analysis of economic trends, an evaluation of the region's successes in implementing programs and projects aimed at improving economic conditions in the region, and a strategy achieving economic growth in future years. The strategy is participatory, and includes input from other economic development agencies, the communities within the region, educational institutions, businesses, and other interested parties.

  As the conduit for EDA and ARC funding in the region, STWRPDB oversees major infrastructure and development projects funded by these federal agencies. STWRPDB also works on major regional initiatives, such as the purchase of 180 miles of rail lines serving the Southern Tier, and the reinstitution of rail service in the region. The agency also works with other economic development groups throughout the county to attract and retain businesses.

- **Chautauqua County Industrial Development Agency (CCIDA)** provides financial assistance to area businesses through two revolving loan funds, industrial development bonds, and tax leases. The CCIDA also provides training for area businesses and works with area businesses to retain jobs. The Agency manages four industrial parks in the County, and was instrumental in the development of two speculative industrial buildings at two of the parks, an aggressive initiative that has proven successful in attracting new firms to the County.

- The **Greater Jamestown and Dunkirk-Sheridan Empire Zones** provide tax incentives to certified businesses located with the boundaries of the zones. Incentives include wage tax credits for newly created jobs, real property tax credits, sales tax exemption, employment incentive credits, business tax reductions, and infrastructure loans. Over 150 businesses have been certified to participate in the Empire Zone programs.

- The **City of Jamestown Development Office** works within the City to attract, retain and grow businesses. The department provides planning, zoning, and building inspection services, and administers entitlement programs such as Community Development Block Grants. The Development Office completed a consolidated plan for the City, as well as a Downtown Commercial Redevelopment Plan. An urban design plan and a traffic plan are currently underway. A key to the successful development of these plans has been participation by community leaders such as the president of the community college, the executive director of the hospital, and business and civic leaders. The

agency has been successful in obtaining grants for these planning studies, as well as a Brownfields Redevelopment Grant to inventory the existing industrial buildings in the City and assess what is needed to clean up the sites. The Jamestown Local Development Corporation is housed within the Development Office, and provides $10,000 to $350,000 loans to local businesses through its $6 million revolving loan fund.

- **Chautauqua Opportunities for Development, Inc. (CODI)** provides assistance to micro-enterprises with five or fewer employees. CODI provides loans of up to $15,000 to businesses that are unable to secure traditional financing. CODI's clients are generally retail and service businesses. The program started in 2000, capitalized through HUD's Small Cities Program. The Small Business Development Center at Jamestown Community College provides management and technical assistance to small businesses throughout the County.

- The **Chautauqua County Workforce Investment Board (CCWIB)** helps match businesses with workers. CCWIB works with businesses to train existing and new employees to keep area businesses competitive. CCWIB recently worked with the developer of a proposed distribution center in Ripley to ensure that the region could supply the 1,000 plus workers expected to be needed at the facility. The **Manufacturing Training Institution** at Jamestown Community College also provides workforce training tailored to the needs of specific businesses.

- The **Chautauqua County Chamber of Commerce** works to promote business in the County in several ways. It provides a networking opportunity for businesses throughout the County to come together to discuss economic development issues and develop strategies to address these issues. Further, the Chamber has evolved into a strong regional voice on state-level policy issues that effect business operations in the state, and has been affective in influencing policy changes favorable to the County. The Chamber also works to attract new businesses to the County by compiling information about business resources and workforce statistics and making this information available when businesses inquire about Chautauqua County locations.

- The for-profit **Buffalo Niagara Enterprise (BNE)**, located in Buffalo, acts a clearing house for information about business locations in western New York. BNE collects and compiles economic and employment data for Chautauqua County, and keeps and up-to-date inventory of available industrial and commercial sites. BNE responds to business inquires and develops and distributes marketing materials promoting the area to businesses.

- The role of **local foundations** in economic development is unique in Chautauqua County. Four Jamestown area foundations have embraced efforts to improve the regions economy, at least one going so far as to adopt economic development as part of its mission. These foundations have helped fund Chautuaqua County staff at the NBE, paid to hire a community grant writer as well as an advocate for

Jamestown and the region in Albany, partially funded Jamestown's urban design plan and activities of the Jamestown Center City Development Corporation, and will fund the initial recommendations of the urban design plan. One foundation fully financed the development of the ice arena in Jamestown to provide an anchor for activity in the west end and create a destination for tourists. The active involvement of foundations has proven critical to the region's ability to succeed in stabilizing and diversifying it economy, and provides a model for other regions to emulate.

In addition to the above, there are several local agencies and organizations that work to promote economic growth in the County.

Key Elements of Economic Development Successes. Six elements of the County's economic development program emerge as central to its successful efforts to stabilize the region's economy during the past several years.

1. **Broadening of focus beyond traditional manufacturing base.** For many years, Chautauqua County identified itself as a manufacturing area. The economic development community focused on attracting and retaining manufacturing facilities, and the workforce expected to obtain manufacturing employment. This strong cultural mindset prevented the region from moving forward with efforts to branch out and exploit other opportunities for economic development, including the service industry and tourism. More recently, the economic development community has recognized the potential of the tourism industry in particular to help stem the loss of jobs in the County and to provide options for new directions. At the same time, the County continues to provide assistance to manufacturers interested in locating starting up, or expanding in the County.

2. **Within manufacturing, a focus on supporting existing businesses.** While the County and its municipalities continue to work with organizations such as Buffalo Niagara Enterprises to attract businesses, the economic development community is focused on working with existing businesses in the sectors which have proven important to the region's economy to ensure that they remain viable. Examples of efforts to support these businesses at both the local and state level include the purchase of the old ConRail lines and reinstitution of rail service to the area, the development of industrial parks with spec buildings aimed at attracting businesses that support the major manufacturing sectors, assistance with reducing energy costs through subsidies, the configuration of Empire Zones to incorporate major manufacturers, and business assistance and job training programs created through the region's institutions of higher education.

3. **Regional partnerships for economic development.** During the past five years, the County has witnessed a clear shift away from an attitude of competition among the many jurisdictions in the County to a regional

partnership for economic development. This partnership is evident in the creation of the Partnership for Economic Development, the participants of which include the Southern Tier West Regional Planning and Development Board, the County Industrial Development Agency, the Greater Jamestown Empire Zone, the Dunkirk-Sheridan Empire Zone, the Cities of Jamestown and Dunkirk, the Chautauqua County Workforce Investment Board, and Westfield Development Corporation. The Partnership provides a forum for discussing and solving barriers to economic development within the County, as well as a one-stop shop for businesses interested in learning more about business development opportunities within the County. The partnership has reduced barriers to entry by opening up channels of communication and providing potential businesses with information about multiple municipalities and programs without needing to make multiple phone calls. Further, the four Empire Zones in the Southern Tier (Jamestown, Dunkirk-Sheridan, Cattagaurus, and Allegany all work together to share leads and to present a united voice in Albany.

Another regional partnership developed five years ago when the north county and south county chambers of commerce merged into a single chamber serving the entire county. The County-wide chamber has a membership of approximately 1,600 firms, representing more than half the businesses in the County. This resulted in improved efficiencies and effectiveness in running the chamber, and better communications between all businesses in the County.

Two additional examples of regional partnerships for economic development extend beyond Chautauqua County. One is the County's involvement with Buffalo Niagara Enterprises (BNE), a for-profit entity that develops marketing information and provides marketing leads for participating organizations. BNE maintains an inventory of available commercial and industrial land within its service area, and works with businesses and localities to solve barriers to entry. The services provided by BNE allow local economic development professionals to focus on site specific issues rather than the maintenance of up-to-date site inventories and marketing materials. In addition to BNE, the Committee for the Future is a consortium of four counties – Chautauqua, Cattaragus, Allegany, and Monroe – whose business and political leadership have come together to identify strategies for moving the region forward.

On a smaller scale, the City of Dunkirk and Town of Dunkirk were able to come to overcome boundary issues by developing a revenue sharing agreement for development in the Town adjacent to the Interstate 90 interchange. In this instance, the City was asked to extend services to the land around the interchange so that the Town could attract development. At first the City balked at extending services without benefit of any of the resulting tax revenue. Working with SUNY Fredonia, the City and Town worked out a revenue sharing agreement, and the City extended the necessary services.

These regional approaches to economic development represent a significant shift away from parochial competition for single businesses. The organizations that have joined forces recognize that economic growth anywhere in the County or the broader region can benefit all of the partners by creating economic activity that can attract additional businesses, and by providing jobs for area residents. These regional efforts have been instrumental in creating a climate of cooperation that is evident to businesses and in helping to stabilize the economy of the County.

4. **Leadership.** Another key element of the economic development efforts in the County is leadership by both the public and private sectors. Community leaders including private sector business executives, the president of SUNY Fredonia, and the County Executive have come together in efforts to stimulate economic growth. They have participated in strategic planning initiatives and in business attraction efforts. Business leaders participating in planning efforts bring a results- oriented attitude to the table, and insist on developing achievable goals with clearly defined steps and assigned responsibilities for making things happen. The County Executive and the Director of the County Industrial Development Agency have shown leadership in developing speculative buildings at the County's businesses parks, which have succeeded in attracting new firms to the area. Both the County's strong leadership and the united voice provided by its partnerships have been instrumental in garnering financial support and grants from both the state and federal governments. The can-do, won't-take-no-for-an-answer attitudes of the County's leadership and its elected representatives in Albany and Washington have been instrumental in helping the County move forward.

5. **The participation of non-profit foundations.** Traditionally, non-profit family and community foundations do not target economic development activities for the focus of their giving. However, in Chautauqua County, four such foundations have proven instrumental in providing funding for economic development programs, and the Gebbie Foundation actually incorporated economic development into its mission. The Gebbie Foundation, as well as the Chautauqua Region Community Foundation, the Lenna Foundation and the Sheldon Foundation have all contributed to strategic planning efforts and local development corporations. The Gebbie Foundation funded the construction of the Jamestown Savings Bank Ice Arena in an effort to provide an anchor for the redevelopment of the west end of downtown Jamestown. By providing funding for key planning and economic development programs, these foundations have leveraged scarce public dollars to better achieve economic development goals in the County.

6. **Transportation investments.** Two significant transportation investments have occurred in Chautauqua County over the past decade, both of which have supported business attraction, retention and expansion efforts. In 1999, New York State Department of Transportation completed work on the upgrade of

the two-lane Route 17 through Chautauqua County to the new four-lane Interstate 86. The project included upgrading 185 miles of two lane roadway to four lanes, as well as a bridge across Lake Chautauqua, saving significant time for travelers. The impacts of the highway improvements are still being realized as more businesses take advantage of the improved access provided by the upgraded facility. Early business investments associated with the highway included new hotels built at or near the highway interchange at Jamestown, and expansion of retail and restaurant uses. The new highway also improves the attractiveness of Ripley as the location of a distribution center.

Another important transportation investment in the region was the purchase, rehabilitation and reopening of the old Southern Tier Extension railroad line, which serves southwestern New York Counties. The project resulted from the efforts of a large consortium that included Southern Tier West Regional Planning and Development Board, Norfolk Southern, Allegany County, Cattaraugus County, Chautauqua County, Steuben County, the Southern Tier Extension Railroad Authority (STERA - which was created to own the railroad), the New York Department of Transportation, and the Western New York and Pennsylvania Railroad. The railroad is owned by STERA and leased back to Norfolk Southern "to facilitate a tax abatement incentive program to redevelop the line." (Southern Tier West Regional Planning and Development Board, p. 16). The line reopened in 2003. Prior to the redevelopment of the line, only 70 carloads per year were shipped on the line. Today, 35,000 carloads per year pass over the line. Although not all of these shipments originate or terminate in Chautauqua County, several businesses including metal fabricators and farm suppliers are using rail sidings and shipping goods via rail. The cheaper cost of shipping by rail has also created competition for trucks, and led to a reduction in truck shipping costs for some businesses.

3.5 Lessons Learned

Chautauqua County's success in stabilizing and diversifying its economy in response to significant structural changes provides several lessons for others facing similar circumstances.

Work to identify and embrace non-traditional opportunities for economic growth. Many regions that have grown and prospered as a result of strong manufacturing sectors have difficulty embracing non-manufacturing sectors as opportunities for growth and expansion. This was true of Chautauqua County for many years. However, in recent years, fueled by the undeniable robust growth in the tourism industry, the Chautauqua County economic development community has embraced tourism as an important component to successful economic diversification and growth. The County's success in diversifying by being willing to look beyond its historical strengths to new opportunities for growth can provide an important role model for

other Appalachian regions.

Continued support for existing business sectors. A typical mistake that distressed regions make is to pursue new national growth sectors at the expense of their existing economic base. While the Chautauqua County economic development community embraced tourism, a new and growing sector, they did not abandon the existing manufacturing businesses within the County. Through selective retention the county recognized that, although declining, the manufacturing base still accounts for the largest share of jobs, and that many in the workforce still depend on these jobs. Therefore, the County continues to offer and develop programs to help the manufacturing businesses in the community. This strategy has proved effective in ensuring a diversified economy by adopting a multifaceted approach to economic development that embraces change while not abandoning its history.

A united voice can provide results. Much of Chautauqua County's success in stabilizing its economy is attributable to the many partnerships that developed to promote economic growth in the throughout the County. The recognition that growth anywhere in the County benefited the whole County, the region was able to come together to provide a united, cohesive image to businesses. This united approached allows for efficiencies in program delivery, facilitates problem solving, and allows for effective, streamlined communication with the business community. In rural areas where economic development resources are in short supply, this approach can be particularly effective. A united voice can also prove effective in garnering state and federal attention and support.

Engage community leaders in economic development efforts. Chautauqua County's economic development program has greatly benefited from strong leadership. This has included the involvement of community leaders in planning initiatives, financial leadership provided by local foundations, and political leadership on policy issues at all levels of government. A successful economic development program, particularly in distressed areas, requires participation by people who do not accept the status quo and who are committed to making change happen.

3.6 Interviewees

Diane G. Hewitt, Director of Economic Development, Chautauqua Opportunities for Development

Michael P. Sullivan, Director of Institutional Relations and Public Affairs, Chautauqua Institution

Richard L. Alexander, Director, County of Chautauqua Industrial Development Agency

Pamela S. Lydic, President, Chautauqua County Chamber of Commerce

Donald Rychnowski, Executive Director, Southern Tier West Regional Planning and Development Board

Terry Norman, Comptroller, Cummins Engines

Rebecca Congdon, Executive Director, Dunkirk-Sheridan Empire Zone

Cory Zahm, Planner, Greater Jamestown Empire Zone

Steven Centi, Director of Development, City of Jamestown

Greg Lindquist, Economic Development Director, City of Jamestown

Andrew Nixon, Executive Director, Chautauqua County Visitors' Bureau

Dr. Leonard Faulk, Director, Rural Regional Development Center, SUNY Fredonia

Greg Serto, Plant Manager, Truck-Lite

Pam Frank, Executive Director, Westfield Development Corporation

4 PIKE COUNTY, KY: *EVOLUTION AS A TRADE CENTER*

4.1 Introduction

Pike County, KY is the eastern-most county of a five county Local Development District that sits adjacent to the WV border. Pike County has managed to move from distressed to transitional status since 2003. However the four remaining counties in this mining-dependent LDD area have not faired the same. The case study explores reasons for Pike's gradual success, the lack of beneficial spillover to its neighboring counties and transferable lessons to other mining-dependent areas of Appalachia.

To many outsiders, Eastern Kentucky's image has remained for decades as a region of persistent poverty. However, the reality is far different. The region is populated with hard working people who have worked diligently to change their image and fortune. Nowhere is this truer than in Pike County.

This case study seeks to determine the root causes of Pike's improvement through a survey of recent studies, statistics and interviews. It explains how Pike County's transformation took place over decades, through a combination of vision, leadership and good fortune that allowed Pike to be transformed into a regional hub with a diversified economy. The "Cut-Thru Project" – a massive infrastructure initiative – was a first step in the County's progress and has brought additional development, access and a spark of belief in itself. Pike's past reliance on coal is being replaced by new economic growth as a regional health, service and retail destination.

4.2 Regional Profile

Pike County lies at the crossroads of eastern Kentucky, although it is located quite a distance from the nearest metropolitan areas in three states (Exhibits 4-1,2). It is also the first in the Big Sandy Area (BSA) Local Development District to graduate from "distressed" to "transitional" status (as designated by the Appalachian Regional Commission in 2003), while its neighboring counties — Floyd, Johnson, Martin and Magoffin –have seen fewer economic opportunities.

Exhibit 4-1. Pike County's Location Within Kentucky

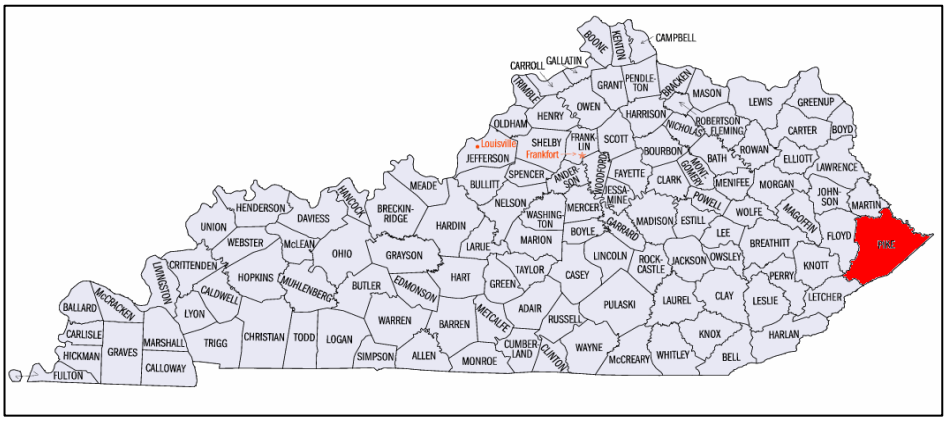
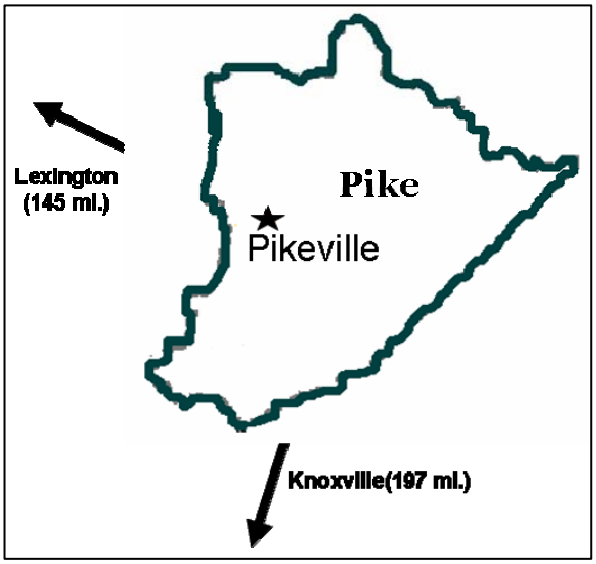


Exhibit 4-2. Distance from Pike County, KY to Selected Major Cities



Pike County, with a population of 70,000 and square mileage of 788 is by far the largest county in the region. Although the local quality of life is improving, the area has been losing population since 1980 (see Exhibit 4-3). The 1970s brought the coal boom and its subsequent influx of people and capital as the industry expanded because of a sharp increase in the price of coal due to regulatory changes and the OPEC oil embargo.

Exhibit 4-3. Big Sandy Region Changes in Population, 1970-2000

	Population				% Change			
Population by County	**1970**	**1980**	**1990**	**2000**	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**
Floyd	35,889	48,764	43,586	42,441	36%	-11%	-3%	18%
Johnson	17,539	24,432	23,248	23,445	39%	-5%	1%	34%
Magoffin	10,443	13,515	13,077	13,332	29%	-3%	2%	28%
Martin	9,377	13,925	12,526	12,578	49%	-10%	0%	34%
Pike	61,059	81,123	72,583	68,736	33%	-11%	-5%	13%
State of Kentucky	3,218,706	3,660,777	3,685,296	4,041,769	14%	1%	10%	26%

Source: US Census Bureau.

After the mid-1980s coal bust, brought about by declining oil prices, new mining in the Western US and industry technology changes, coal mining declined but still maintained a presence in the region. As mining technologies changed, workers were not as needed as pure labor, but rather as machine operators and technicians. This technology shift had a large impact on employment: once plentiful high-wage, low-skill jobs vanished. As jobs and amenities vanished, so did area residents.

While this decline is leveling off, it has left the region without much of an increase in population since the 1970s. Partially because of this stagnation, and partially because of lingering stereotypes about employee skill levels and poverty levels, businesses have hesitated to locate in the area. Travel to the metro Lexington or Ashland / Huntington / Charleston is necessary to go to a large shopping mall or national chain restaurant or for recreational activities like ice skating. As a result, area college graduates who have spent the last four-plus years in a metro area hesitate to return home.

Changes in population are mirroring a dramatic change in the county's industry mix. Once ruled by coal, Pike is now showing strength in services (especially healthcare) and retail, but this has not meant that coal has completely diminished as a vital sector the county's economy.

Mining companies have been expanding recently, thanks to new demand for coal and new processing technology. However, employers report difficulty in finding qualified applicants. Many companies are willing to pay for training "for the right person," and are offering high starting salaries ($40,000+). The importance of mining to the county's economy is illustrated by the fact that despite dramatic reductions in employment levels from 1970, 14% of the workforce still is employed by the industry. Exhibit 4-4 shows just how concentrated the coal industry is in Pike County, with the county showing a location quotient of 16.8 compared with Kentucky as a whole and 58.1 when compared with the nation. Considering that anything over a 1.0 is considered a higher than expected concentration, it is clear that Pike County remains a coal-based economy.

But as Exhibits 4-4 and 4-5 show, there are other sectors that are emerging. Of special note is the location quotient of 1.2 for health care and social services. The increased importance of the health care industry suggests a new direction for Pike County, one that is having dramatic impact on the ways in which the county serves as a hub for neighboring communities.

Exhibit 4-4. Pike County Employment by Industry, 1970-2000

	1970		1980	1990	2000	
EMPLOYMENT		**% of Tot.**				**% of Tot.**
Farm employment	40	0.3%	50	60	50	0.2%
Agricultural Services	20	0.1%	40	140	200	0.6%
Mining	5,490	35.1%	9,950	6,420	5,200	16.8%
Construction	550	3.5%	1,360	1,150	1,200	3.9%
Manufacturing	260	1.7%	320	420	910	2.9%
Transportation, Comm., PU	1,110	7.1%	2,020	2,010	2,040	6.6%
Wholesale Trade	390	2.5%	810	840	930	3.0%
Retail Trade	2,500	16.0%	4,110	5,520	6,830	22.0%
FIRE	420	2.7%	750	1,160	1,380	4.4%
Services	2,550	16.3%	4,330	6,190	8,380	27.0%
Government	2,300	14.7%	3,350	3,750	3,910	12.6%
Total	15,630	100.0%	27,090	27,660	31,030	100.0%

% CHANGE	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**	**1980-2000**
Farm employment	25.0%	20.0%	-16.7%	25.0%	0.0%
Agricultural Services	100.0%	250.0%	42.9%	900.0%	400.0%
Mining	81.2%	-35.5%	-19.0%	-5.3%	-47.7%
Construction	147.3%	-15.4%	4.3%	118.2%	-11.8%
Manufacturing	23.1%	31.3%	116.7%	250.0%	184.4%
Transportation, Comm., PU	82.0%	-0.5%	1.5%	83.8%	1.0%
Wholesale Trade	107.7%	3.7%	10.7%	138.5%	14.8%
Retail Trade	64.4%	34.3%	23.7%	173.2%	66.2%
FIRE	78.6%	54.7%	19.0%	228.6%	84.0%
Services	69.8%	43.0%	35.4%	228.6%	93.5%
Government	45.7%	11.9%	4.3%	70.0%	16.7%
Total	73.3%	2.1%	12.2%	98.5%	14.5%

Source: CEDDS Volume II, 2002 Woods and Poole Economics, Inc.; EDR Group

Exhibit 4-5. Selected Pike County Industry Location Quotients, 2002

NAICS	Sector	Pike / Kentucky	Pike / U.S.
111	Crop Production	0.00	0.00
112	Animal Production	0.10	0.17
113	Forestry & Logging	1.10	1.60
114	Fishing, Hunting & Trapping	0.00	0.00
115	Support for Agriculture & Forestry	0.00	0.00
211	Oil & Gas Extraction	7.30	5.09
212-213	Mining & Support Activities	14.80	38.13
221	Utilities	2.20	1.80
230	Construction	0.80	0.58
311	Food Products	1.10	1.24
312	Beverage & Tobacco Products	0.00	0.28
313	Textile Mills	0.00	0.00
314	Textile Product Mills	0.00	0.09
315	Apparel Manufacturing	0.00	0.00
316	Leather & Allied Products	0.00	0.00
321	Wood Products	0.20	0.26
322	Paper Manufacturing	0.00	0.00
323	Printing & Related Support Activities	0.00	0.11
324	Petroleum & Coal Products	0.00	0.00
325	Chemical Manufacturing	0.00	0.00
326	Plastics & Rubber Products	0.00	0.00
327	Nonmetallic Mineral Products	0.30	0.39
331	Primary Metal Manufacturing	0.00	0.00
332	Fabricated Metal Products	0.00	0.09
333	Machinery Manufacturing	0.20	0.20
334	Computer & Electronic Products	0.00	0.00
335	Electric Equipment, Appliances, etc.	0.00	0.16
336	Transportation Equipment	0.00	0.04
337	Furniture & Related Products	0.00	0.03
339	Miscellaneous Manufacturing	0.00	0.10
420	Wholesale Trade	0.50	0.61
441-454	Retail Trade	1.40	1.49
481-487	Transportation	1.40	1.35
491-493	Mail, package delivery & warehousing	0.20	0.31
511	Publishing Industries (except Internet)	0.30	0.37
512	Motion Picture & Sound Recording	0.00	0.14
513	Broadcasting	0.90	0.60
514	Internet & data process svcs	0.00	0.00
521-533	Monetary, Financial, & Credit Activity	0.90	0.66
521	Insurance Carriers & Related Activities	1.00	0.80
525	Funds, Trusts, & Other Financial Vehicles	0.00	0.00
531	Real Estate	0.60	0.45
532	Rental & Leasing Services	0.80	0.36
533	Lessors of Nonfinancial Intangible Assets	0.00	0.00
541-551	Professional/Scientific, Technical, Services	0.80	0.51
561	Administrative & Support Services	1.30	1.10
562	Waste Management & Remediation	0.50	0.55
611	Educational Services	2.20	1.64
621-624	Health Care & Social Services	1.20	1.22
711-713	Amusement & Recreation	0.20	0.34
721-722	Accommodations, Eating & Drinking	1.10	1.08
811-812	Repair, Maintenance, & Personal Services	1.21	1.19
813	Religious, Civic, Professional, Organizations	0.50	0.29
814	Private Households	0.20	0.61
920	Government & non-NAICs	0.80	0.85

Source: EDR-LEAP (with IMPLAN data) and EDR Group.

Pike County has acknowledged the need to diversify industry, and has strongly supported the development of two industrial parks: the 200-acre Honey Branch Regional Industrial Park (located in Martin County) and the 11-acre Mossy Bottom Industrial Park (located in Pike County). The Honey Branch Park was a cooperative effort between all of the Big Sandy Area counties and is adjacent to a federal prison site. This park has been successful in attracting tenants, and the coalition of counties shares in the generated tax revenues. Mossy Bottom has had more difficulty in retaining tenants but has several successful firms.

Another industrial force is the Kellogg Company's Pikeville Plant. Originally recruited by former Kentucky Governor Paul Patton when he was Pike County Judge Executive, Kellogg has developed the facility into one of the country's largest suppliers of Nutri-Grain bars and Pop-Tarts. Nearly 400 people are employed there.

Pike also benefits from an innovative telecommunications company locating its headquarters in downtown Pikeville, and from focusing on additional training for both the police and fire departments. These two departments have state of the art equipment and have begun training other departments in the region.

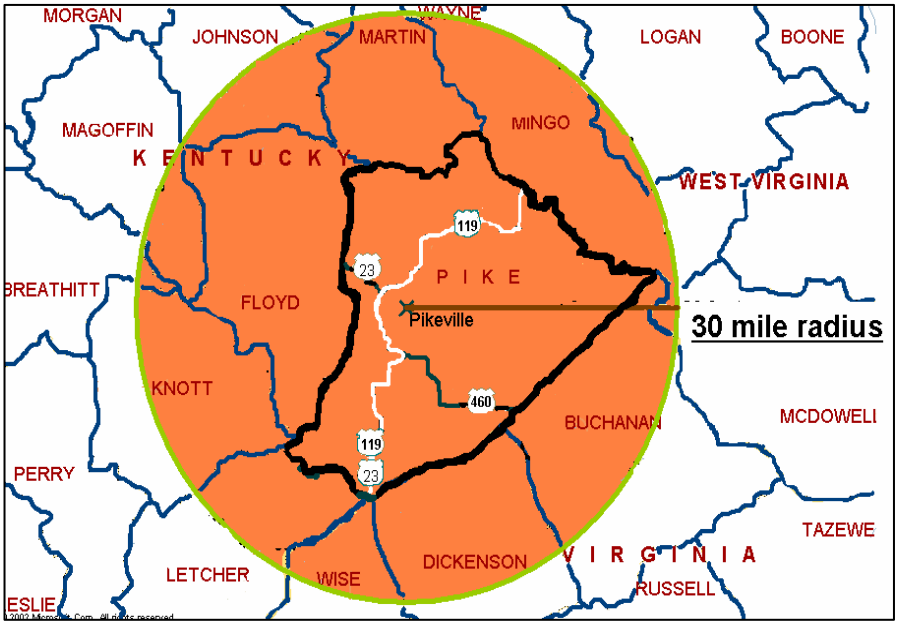
Perhaps the greatest influence in Pike's changing industry mix and development into a regional center is the partnership between Pikeville College and Pikeville Medical Center (PMC). PMC is the largest private employer in Eastern Kentucky with 1,300 employees; with 261 beds and over 535,000 square feet, it operates as the region's medical center. Pikeville College is a private four-year college that offers four associate degree programs, 23 baccalaureate degree programs and one doctoral program – the School of Osteopathic Medicine, which ARC helped to fund.

4.3 Evolution of Progress

As the largest county in the Big Sandy Region, Pike County serves as the area's hub of activity. Both people and materials flow into the county in a way that has helped spur the county's relative growth.

Transportation Access. Part of the reason for its ability to act as a hub among other counties in the region is the county's location at the intersection at some of the best roads in the region. Pike County stands at the crossroads between Kentucky, West Virginia and Virginia and is the center hub between Lexington (KY), Knoxville (TN) and Huntington and Charleston (WV). It is home to four major US highways: US 460, 23, 119 (ADHS Corridor G) and 80. Highway 23 (segment south of Pikeville, Corridor B), which was tuned into a four-lane highway nearly a decade ago, has become a major north-south connector. Another highway, 119, should be completed within the next year, and will connect Pikeville with South Williamson, WV (see Exhibit 4-6). Pike is also home to a regional private airport with a 5,000-foot runway and also has good rail line access.

Exhibit 4-6. Highway Access for Pike County



The newly built Eastern Kentucky Exposition Center in Pikeville, which also has a 7,000-seat arena, is expected to be a strong area attraction because of its conventions, cultural events and entertainment. Built on land reclaimed as part of the Cut-Thru Project, it is estimated that the Center will have a $10 million impact on the local economy with the bulk of that figure coming from visitors outside the state. The Center's projected impact will also bolster two currently booming industries in Pike County: retail trade and services—and a new downtown hotel hopes to capture some of the traffic generated by the facility.

The improvements in infrastructure make Pike more "commuter friendly," and are expected to bring more people into the region, which will further develop Pike's reputation as a hub, especially its ability to attract shoppers from neighboring counties. While it does not have a large mall with its typical mix of national retail establishments, it does offer a number of department-type retail stores in addition to big-box retailers. Pike offers nearly double the number of both food service/drinking places and retail trade establishments than the next largest concentration, as shown in Exhibit 4-7.

The City of Pikeville is also burnishing its image through two major renovation projects: relocating all overhead wires (power, cable and phone) to underground conduits and the Main Street Renaissance Program, which is a large-scale beautification project.

Exhibit 4-7. Number of Establishments and Revenue, 2002

Type of Establishment	County	Number in Category	Business Revenue (in '000s)
Food services & drinking places	Pike	74	$50,943
	Floyd	39	$19,831
	Johnson	31	$19,393
	Martin	13	D
	Magoffin	11	$4,994
Retail trade	Pike	324	$783,587
	Floyd	191	$341,056
	Johnson	121	$267,789
	Martin	46	$68,629
	Magoffin	43	$51,515

Source: US Census Bureau D = not disclosable; data is suppressed

Industry. In addition to being the region's top coal producer (35 million tons, almost 20 percent of Kentucky's total coal production), Pike County is headquarters for financial institutions and holding companies worth more than $1 billion in assets – the third largest concentration in Kentucky. It also ranks fifth in Kentucky in both total retail sales and effective buying income, and is the seventh biggest contributor to the state's budget in individual income tax paid and eighth in sales tax paid.

In terms of employment, Pike County's commuting patterns (Exhibit 4-8) show that most of Pike County's residents work in Pike County – only 14.6 percent of Pike County's labor force participants working in another county. Pike County also attracts workers from throughout the region, with Floyd County providing the most workers from the Big Sandy region. However, as this data is nearly five years old, new patterns may have emerged, especially with new highways opening. The expansion of US 23, 460 and 119 has – and will – enhance mobility throughout the region, making it easier for workers to travel for their jobs and for companies to expand and relocate.

Exhibit 4-8. Workers Commuting to Pike County, 2000

Lives in	Works in Pike	As % of home county employed labor force	Percent of home county workers working elsewhere (not including Pike)
Pike	18,455	85%	15%
Floyd	2,221	18%	13%
Mingo, WV	1,244	16%	21%
Martin	186	6%	27%
Johnson	395	5%	28%
Magoffin	206	5%	36%
Buchanan, VA	362	4%	24%

Source: Kentucky State Data Center; Virginia Employment Commission; Bureau of Business and Economic Research, West Virginia University

As noted before, the Pikeville Medical Center (PMC) has boosted Pike County's economic and healthcare profile. It offers services unavailable elsewhere in the greater Big Sandy region, such as:

- Neurosurgery
- The Heart Institute with Philips Allura Interventional Catheterization Labs
- The Leonard Lawson Cancer Center
- The Family Practice Clinic
- 40-bed Inpatient Rehabilitation Hospital
- Home Health
- Medical Detoxification Unit
- MedFlight of East Kentucky
- Level II +/- III NICU
- Sleep Disorders Clinic
- The Birth Place (largest obstetrical service in the region)
- Pediatric Transitional Care Unit
- Siemens ONCOR Linear Accelerator (second in the nation)
- PET Scanning and other state of the art diagnostic department

These divisions offer top-notch care to the residents of Eastern Kentucky and beyond, as it attracts patients who would rather be closer to home than travel to Lexington, Louisville, or Huntington/Charleston for top-tier services. With its almost holistic provision of services, the hospital is able to provide for almost any need the local population has, from heart surgery to addiction. Although there are several other hospitals in the region (Paul B. Hall in Johnson County, Highlands Regional Medical Center in Floyd and Our Lady of the Way in Martin), they do not offer the level of care PMC does.

The hospital is also spurring some concurrent cluster growth, with physicians setting up private practice and medical service centers. Community leaders also hope for medical suppliers and research to locate in the area, especially because of the chronic health needs of the population.

Part of the reason for this boom is the unique partnership between the PMC and Pikeville College's School of Osteopathic Medicine, which opened in 1997 with a class of 60 students. Its genesis was the result of a Johnson County resident who believed the area needed a medical school to alleviate chronic shortages of doctors. Because Pikeville College had the existing infrastructure necessary to support such an initiative, the school was opened at the College. To date, 282 Doctors of Osteopathic Medicine have graduated from the school, and many have stayed in the region as primary care providers. The local medical community is very supportive of the medical college's mission, and many medical students complete residencies at PMC.

PMC also recently established the Pikeville Medical Development Corporation with the mission to:

- Develop collaborative research initiatives between PMC and major medical research entities in Louisville as well as Pikeville College School of Osteopathic Medicine and other similar institutions.

- Create an e-Health system at PMC which will serve as a model for other medical entities throughout the Commonwealth.

- Obtain public and private funding for the development of the local economy and for the expansion of the programs and facilities at PMC.

- Create a high-tech, regional research and development Institute in eastern Kentucky to work with other medical partners in fostering advanced medical-related concepts and other new economy-type startup companies.

- Encourage private companies to locate in eastern Kentucky so as to enhance economic stability.

- Link the economic engine of PMC with the economic development activities of governmental, non-profit and for-profit entities in eastern Kentucky.

While lofty, these goals provide an ideal – much like the Cut-Thru Project – for leaders to aspire. A 2003 report by the KY Rural Health Works estimates that the economic impact of Pike's health care system was significant to the county's growth. This report estimates that for every health care job, an additional .40 jobs are created in the local economy; for every dollar of health care labor income, an additional $0.25 of income was generated in the local economy. Assuming a similar effect in Pike County, an average wage of $30,000 would provide approximately $7,500 for the local economy.

In addition to keeping local health care dollars local and attracting outside dollars, the industry also has the potential to act as a magnet for both similar and other industries.

4.4 Catalysts of Change

Pike County has benefited from three opportunities that are not as pronounced in the rest of the Big Sandy Region: vision and leadership, political fortune, and funding.

Vision and Leadership. Shortly after his election in 1960, Pikeville Mayor William Hambley first began talking about the Cut-Thru Project. Mayor Hambley's vision was to move mountains – a mile and a half long channel through them – to provide a

corridor that would contain railroad tracks, US highways 23, 80, 119 and 460, and the Levisa Fork of the Big Sandy River. This project, completed in 1987, alleviated annual flooding and provided nearly 400 acres of additional developable land, almost all of which has been developed. Although this project took nearly three decades, Mayor Hambley never wavered in his belief in the project, and was able to promote it to many other local leaders.

Former Governor Patton, a protégé of Mayor Hambley, also developed programs that gave Pike County a good jumping-off point. As County Judge Executive, he instituted mandatory solid waste pickup and began the process of installing water and sewer lines throughout the county. While these projects may seem minor, it is important to remember Pike's difficult terrain, as well as the difference made by water, sewer and solid waste pickup access. Governor Patton also provided momentum during his time as governor and lieutenant governor by supporting progressive policies, infrastructure and investing state dollars in local initiatives; by some estimates, up to $500 million was brought to the area.

The current Pikeville City Manager, Donovan Blackburn, has also initiated several recent projects to boost the area's profile. A 2003 comprehensive strategic plan was the first in more than a decade and part of an initiative to modernize and enhance local development, which also included the hiring of a dedicated maintenance manager and an economic development officer, and the expansion of access to technology throughout city government.

Other local leaders are promoting development strategies around tourism. Pike County Magistrate Chris Harris believes strongly in the potential of an ATV trail system. West Virginia's trail system is heavily used and draws tourists from a wide geographic area. Harris believes that connecting West Virginia and Kentucky through a trail system will bring additional visitors to the area, and keep visitors in the area longer.

Another potential attraction is a series of reclaimed mining areas. These areas have been used to demonstrate varying methods of reclamation, and some are fully forested and support elk populations. It is hoped that these areas will become nature preserves, and they may also offer the possibility of an annual elk hunt.

Political Fortune and Funding. While much of the credit for the area's turnaround must be given to the local community, it is also very important to note the impact of state funding targeted to Pike during both Mayor Hambley's tenure and Governor Patton's time in Frankfurt. Estimates of state program funding during Patton's tenure run as high as $500 million – a significant amount for a county of roughly 70,000 people. Granted, the area's needs were great, both in terms of infrastructure and social and development programs, but this amount gave Pike an extra boost as compared to its BSA neighbors.

Pike also benefits from the Coal Severance Tax. This tax is designed to provide a resource for economic and social development as a means to replace the income lost

when area coal resources are depleted. State statute requires that 50 percent of this tax is returned to coal-producing counties, with the remainder going to the state's general fund; however, it is difficult to determine whether this mandate has been filled. According to the Kentucky Department of Revenue, tax receipts since the 1970s have totaled more than $4.6 billion dollars, with nearly $1 billion collected from coal mined and/or processed from Pike County. These dollars have been used to fund local projects, such as water and wastewater projects, osteopathic medical school loan forgiveness, and industrial park and economic development.

Exhibit 4-9 shows the value of severed and processed coal, along with the tax receipts incurred by the Coal Severance Tax. The tax assesses 4.5 percent of the value of mined ("severed") coal, for at least $0.50 per ton. Pike County provides the largest share of the tax receipts of all mining counties throughout the state, nearly $40 million. Martin County accounts for the next highest share of revenue, with slightly over $8 million. Pike's revenue from the tax, according to formula, should be $20 million.

Because of their larger tax base, Pike County has been able to take the "extra steps" needed to wean itself from traditional industries as well as provide development funding for the County. Nevertheless, Pike still faces challenges in industry diversification and workforce training.

Exhibit 4-9. Coal Severance Tax Revenue, FY 2002-2003

	Gross Value of Severed Coal	Tax on Severed Coal	Gross Value of Processing	Total Tax Receipts
Kentucky Total	$2,838,514,744	$125,530,144	$356,948,150	$141,488,813
E. Kentucky	$2,390,638,851	$105,361,781	$300,451,561	$118,783,697
Pike	**$766,110,260**	**$34,112,484**	**$120,971,083**	**$39,568,774**
Perry	$250,870,326	$11,509,372	$39,392,890	$13,287,261
Knott	$278,760,063	$12,295,994	$17,513,323	$13,156,757
Harlan	$255,715,512	$11,497,770	$11,256,571	$12,024,444
Martin	*$155,881,929*	*$6,956,284*	*$27,915,765*	*$8,223,374*
Leslie	$129,087,420	$5,810,747	$19,042,562	$6,669,475
Bell	$85,172,600	$3,793,572	$13,004,196	$4,414,843
Floyd	*$87,133,866*	*$3,789,958*	*$4,685,984*	*$3,994,261*
Johnson	*$16,926,563*	*$761,696*	*$2,346,803*	*$867,303*
Magoffin	*$17,155,789*	*$772,012*	*$246,405*	*$783,095*

Source: Kentucky Revenue Cabinet

4.5 Lessons Learned

While it is difficult to replicate the specific factors that guided the Pike County's growth, other mining dependent areas of Appalachia can take away some guidance from its experience.

Leadership and Regionalism. Perhaps the most important asset of Pike County is the strong leadership by several public servants, including former Mayor Hambley and former Governor Patton. They both developed visions for Pike County, remained focused on the outcomes, and fought for resources to fulfill their goals. While this tactic was arguably simpler because of Governor Patton's position and political skill, their initial leadership was the starting point. While many in the area thought the Cut-Thru Project would never come to fruition, it did – bringing respite from floods, additional developable land, and more importantly, a sense of pride and accomplishment.

The five county region now works together more frequently, continuing a collaborative approach begun years ago. The BSA has been particularly successful on major projects such as the Honey Branch Regional Industrial Park, in which 200-acres was developed for industrial use and is adjacent to a federal prison. This initiative was perhaps one of the first collaborative projects in the BSA, and resulted in new jobs and a landmark profit-sharing agreement. Another example is the City of Pikeville's willingness to install water and sewer lines outside of city limits, particularly along the US 23 corridor between Pikeville and Floyd County. This infrastructure will induce additional development and will benefit both counties. The counties are also benefiting from leaders who are willing to try new approaches, such as those in Pike and Johnson Counties.

While relationships between the counties are not always ideal, and such bonds are difficult to form, it is important to note the possibilities and results from such communication. By having strong leaders willing to work as a region, municipal sub-units of that area are more likely to prosper. This will be particularly important to Johnson, Martin, and Maggofin counties which while adjacent to the economic progress of Pike County are not sharing in the opportunity. Floyd County has decent highway access to Pike County which has clearly enabled 18% of Floyd's labor force participants to import their wages from jobs held in Pike County.

Determination, or, Slow and Steady Wins the Race. Pike County leaders developed some very ambitious projects – some would say overambitious or impossible, as in the case with the Cut-Thru Project. However, these leaders persevered and continued to work on their goal: additional developable land and jobs. Although it has taken decades, Pike County has gained developable land, jobs, infrastructure and, as noted before, a spark of encouragement. This spark led to a number of projects, including a

new multi-use park and a performing arts center in downtown Pikeville. Area leaders believe this project will begin a chain reaction of development. Even before opening, Pikeville was able to attract a new chain hotel for its downtown, which will begin construction shortly. Pikeville approached a national chain about building a downtown hotel a few years ago and was told it wasn't feasible. However, they went back after some time, made another presentation, and expect the new hotel to be ready soon.

Industrial diversification is key but not easy

Pike County is growing in part because community leaders have recognized that depending on coal for their county's livelihood no longer made sense. In 35 years, the percentage of the county's employees in the mining industry has dropped from 35 percent to 14 percent, a huge shift. Accordingly the county has begun to look to other industries to fill the void left by the shrinking mining industry.

The best example occurs with the growing health care industry in the county. The partnership between Pikeville College and the Pike Medical Center show how a community asset, in this case the college, can build a new industry, in this case health care. It also shows how Pike is recognizing its role as a regional hub. The Medical Center now is the preeminent health care facility in the Big Sandy Region.

Another key has been recognizing that the environmental impacts of the mining industry can be addressed in a way that is positive to the economy. The University of Kentucky's College of Agriculture has been successful in determining the most effective ways of reclaiming former mine sites, and County leaders are looking at ways to reclaim this land into such uses as wildlife preserves and ATV trails that could attract tourists to the naturally beautiful region.

Of course, the large-scale economic shift away from mining is not without its challenges. The biggest one being the presence of so many displaced, and in this case often disabled, workers. Helping these workers find new opportunities, especially in jobs that can pay beyond a living wage, is a consistent challenge facing both workforce and economic development teams. This is especially difficult given that manufacturing, which at least would seem to offer similar wages and use similar skills to mining, has been so slow to develop in the county. If the county wants to continue to grow, figuring out ways to enhance the manufacturing sector will be critical.

Similarly, because the mining industry seems to be experiencing a resurgence, and because these firms provide crucial tax revenues, adequate workforce training should be made available to those seeking work as a miner. Because technology plays such an important role now, possible cross-training opportunities (i.e. safety or heavy equipment) could exist with other industries.

4.6 Interviewees

Donovan Blackburn, Pikeville City Manager

R. Tucker Daniel, Johnson County Judge/Executive

William Deskins, Pike County Judge/Executive

Dennis Dorton, President, Citizens National Bank

Robert M. "Mike" Duncan, Chairman and CEO, Inez Deposit Bank and Republican National Committee General Counsel

Don Graves, professor and former chair, University of Kentucky College of Agriculture

Chris Harris, Pike County Magistrate (District 6)

Paul Patton, former Kentucky Governor and Lieutenant Governor and Pike County Judge/Executive

David Pelphrey, Dean of Community, Workforce, Economic Development, Big Sandy Community and Technical College

Karen Sue Ratliff, Deputy Pike County Judge/Executive

Sandy Runyon, Executive Director, Big Sandy Area Development District

Terry Spears, Vice President for Development, Pikeville College

5 MARION & MONONGALIA CO, WV: *HIGH-TECH INITIATIVE*

5.1 Introduction

Monongalia County, WV is a metro county (home to Morgantown), while adjacent Marion County is a "micropolitan" area. Marion County had prior mining roots. This case study examines the development of a hi-tech initiative in these two counties with emphasis on the role of educational-training assets and the extent to which Marion County is achieving diversification in its economy.

The two-county region of Monongalia County and Marion County, in West Virginia, show clear signs of economic growth and improvement over the past five years. The average income and average wage of the two counties have increased, and the rate of job growth and entrepreneurship is also increasing. These changes are the product of a confluence of several factors: the presence of higher education assets; the increasing role of local capital; and, importantly, federal investments which have combined to create local and regional economies whose upward dynamics contrast with the trends governing the economy of the rest of West Virginia. The hypothesis going into this study is that the role of technology development may have been pivotal in bringing about these changes. As the study shows, technology has been a key factor but without the region's entrepreneurial energy and collaborative capacities, technology could not have brought about the changes that the region has seen.

5.2 Regional Profile

Tucked into the north central nook of uppermost West Virginia, the Monongalia-Marion region is at the crossroads of two regions – often called the northernmost point in the South and the southernmost point in the North (Exhibits 5-1 and 5-2).

Exhibit 5-1. Location of Marion and Monongolia Counties

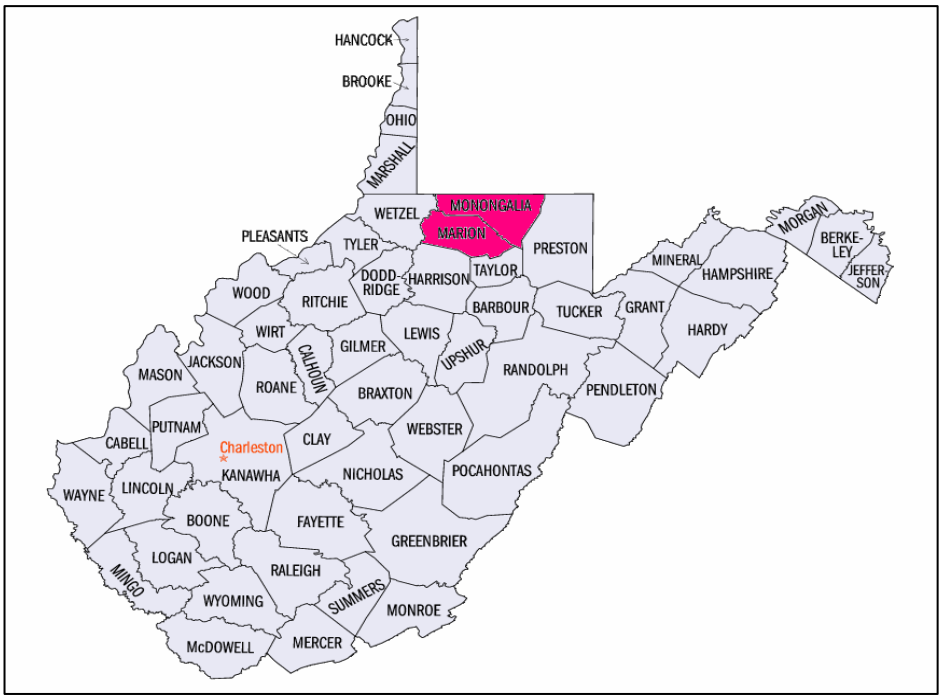


Exhibit 5-2. Marion and Monongalia County Detail

The region's economic, industrial, and cultural identity is distinct from that of West Virginia as a whole. While the rest of the state has experienced the loss of much of the mining and manufacturing jobs that have dominated its economy for years, Monongalia and Marion are experiencing increases in both jobs and income, as well as expansion in high-value growth industries. The growth in this region stands in strong contrast to the economic trends governing the rest of the state. In fact, the region added jobs at an average annual rate of 1.3 percent between 2000 and 2004, while the state as a whole (and the nation as a whole) lost jobs (source: *West Virginia Economic Outlook: North Central Region and Morgantown MSA Outlook, Forecast 2005 – 2009.* Bureau of Business and Economic Research, West Virginia University).

Population Growth. As shown in Exhibit 5-3, population in Marion County has declined over the past 30 years while Monongalia County has continually gained population. In fact, between 1990 and 2000 while the State as a whole grew by less than 1 percent, Monongalia County grew by more than 8 percent.

Exhibit 5-3. Population Growth, 1970-2000

	Population				% Change			
Population by County	**1970**	**1980**	**1990**	**2000**	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**
Marion County	61,356	65,789	57,249	56,598	7.2%	-13.0%	-1.1%	-7.8%
Monongalia County	63,714	75,024	75,509	81,866	17.8%	0.6%	8.4%	28.5%
State of West Virginia	1,744,237	1,949,644	1,793,477	1,808,344	11.8%	-8.0%	0.8%	3.7%

Source: US Census Bureau.

In Monongalia County, the major city is Morgantown, which has recently grown enough to be designated a metropolitan statistical area (comprising Monongalia and Preston counties). Morgantown is the largest, fastest-growing, and most prosperous municipality in the region, with a population increase of 3.6% (25,879 to 26,809) between the 1990 and 2000 Census, and with an average income far exceeding other communities. Marion County's corridor city is Fairmont, also growing, but less rapidly than Morgantown. Morgantown is the home of West Virginia University, which includes a large undergraduate and graduate student body as well as a comprehensive health system; the university employs over 5,000 faculty and is largely responsible for the region's high concentration of employment in government.

Composition of the Regional Economy. Exhibits 5-4 and 5-5 show employment by industry trends in each county between 1997 and 2002. However, the economy of this two-county region is heterogeneous, with quite distinct trends governing the economic changes in the region's two major towns as compared to the region's more rural areas. In fact, the regional economy is best understood by expanding the view beyond these two counties to include Preston County, directly east of Monongalia County, and Harrison County, directly south of Marion County.

Exhibit 5-4. Marion County Employment by Industry, 1997-2002

NAICS	Sector	1997	2002	Annual Growth	West Virginia	United States	2002 LQ Marion / West Virginia
111	Crop Production	203	127	-15.4%	-8.8%	-2.9%	0.5
112	Animal Production	146	198	11.3%	11.7%	8.1%	0.6
113	Forestry & Logging	17	0	-100.0%	-3.9%	-4.9%	0.0
114	Fishing, Hunting & Trapping	0	0	-100.0%	142.5%	12.5%	0.0
115	Support for Agriculture & Forestry	16	0	-100.0%	-2.1%	1.1%	0.0
211	Oil & Gas Extraction	38	49	5.3%	-1.3%	-5.7%	0.3
212-213	Mining & Support Activities	1,288	956	-5.8%	-1.6%	2.9%	1.6
221	Utilities	470	610	5.3%	-4.1%	-4.9%	3.6
230	Construction	2,398	2,498	0.8%	-3.8%	0.2%	1.6
311	Food Products	9	15	10.1%	0.0%	0.4%	0.0
312	Beverage & Tobacco Products	0	0	0.0%	3.0%	-0.6%	0.0
313	Textile Mills	0	0	-100.0%	-0.3%	-4.8%	0.0
314	Textile Product Mills	20	3	-32.8%	-5.6%	-4.4%	0.0
315	Apparel Manufacturing	0	0	-100.0%	-20.9%	-13.6%	0.0
316	Leather & Allied Products	0	0	-100.0%	-45.2%	-11.5%	0.0
321	Wood Products	34	38	2.2%	-1.3%	-3.8%	0.1
322	Paper Manufacturing	31	165	39.6%	-5.3%	-3.6%	7.7
323	Printing & Related Support Activities	117	20	-29.7%	0.2%	-3.6%	0.8
324	Petroleum & Coal Products	0	0	-100.0%	14.5%	-2.9%	0.0
325	Chemical Manufacturing	2	0	-100.0%	-4.5%	-4.5%	0.0
326	Plastics & Rubber Products	31	61	14.2%	8.8%	-3.0%	0.5
327	Nonmetallic Mineral Products	23	8	-19.5%	-4.7%	-2.6%	0.0
331	Primary Metal Manufacturing	338	168	-20.8%	-5.5%	-4.8%	0.7
332	Fabricated Metal Products	269	446	9.2%	-4.9%	-2.5%	2.4
333	Machinery Manufacturing	93	99	0.8%	-5.1%	-4.7%	1.6
334	Computer & Electronic Products	78	16	-26.9%	-4.4%	-5.3%	0.8
335	Electric Equipment, Appliances, etc.	494	118	-29.8%	-6.2%	-5.3%	5.2
336	Transportation Equipment	49	57	3.0%	3.2%	-3.9%	0.4
337	Furniture & Related Products	54	79	7.9%	0.7%	0.0%	1.4
339	Miscellaneous Manufacturing	43	30	3.1%	-2.6%	-2.0%	0.8
420	Wholesale Trade	605	521	-5.0%	-5.1%	-3.2%	0.7
441-454	Retail Trade	3,358	2,944	-3.9%	-0.8%	-0.3%	0.9
481-487	Transportation	452	431	-1.0%	0.7%	1.7%	0.7
491-493	Mail, package delivery & warehousing	203	143	-4.4%	1.3%	6.4%	0.6
511	Publishing Industries (except Internet)	235	114	-13.5%	-3.7%	-4.0%	1.0
512	Motion Picture & Sound Recording	73	27	-17.7%	-13.4%	-4.4%	1.4
513	Broadcasting	197	151	-4.9%	0.5%	2.9%	0.7
514	Internet & data process srvs	75	136	12.7%	-3.4%	6.1%	7.1
521-523	Monetary, Financial, & Credit Activity	393	418	4.8%	1.0%	1.8%	0.9
524	Insurance Carriers & Related Activities	375	288	-4.5%	0.2%	-1.2%	0.9
525	Funds, Trusts, & Other Financial Vehicles	3	13	35.9%	10.5%	12.3%	0.0
531	Real Estate	284	348	4.1%	9.6%	9.7%	0.8
532	Rental & Leasing Services	97	189	14.2%	7.5%	6.9%	1.2
533	Lessors of Nonfinancial Intangible Assets	1	2	12.8%	-17.2%	-8.5%	0.0
541-551	Professional Scientific, Technical, Services	1,227	1,650	6.1%	1.5%	7.0%	1.5
561	Administrative & Support Services	1,100	1,327	3.8%	2.3%	0.0%	1.3
562	Waste Management & Remediation	63	66	0.8%	3.7%	8.9%	1.2
611	Educational Services	192	149	-4.9%	-0.6%	0.1%	0.5
621-624	Health Care & Social Services	1,871	2,359	4.7%	3.2%	2.6%	0.8
711-713	Amusement & Recreation	183	210	2.9%	7.4%	3.7%	0.5
721-722	Accommodations, Eating & Drinking	1,461	1,809	4.4%	1.4%	2.3%	1.0
811-812	Repair, Maintenance, & Personal Services	1,146	1,307	5.4%	3.4%	3.8%	1.7
813	Religious, Civic, Professional, Organizations	453	240	-12.0%	-4.3%	1.4%	0.7
814	Private Households	243	205	-3.3%	9.4%	10.1%	0.7
920	Government & non NAICs	3,701	4,141	1.8%	0.1%	1.0%	1.0
	TOTAL	25,448	26,288				

Source: EDR-LEAP (with IMPLAN data).

Exhibit 5-5. Monongalia Co. Employment by Industry, 1997-2002

		Monongalia County			Annual Growth		2002 LQ
NAICS	Sector	1997	2002	Annual Growth	West Virginia	United States	Monongalia Co./ West Virginia
111	Crop Production	325	170	-12.1%	-8.8%	-2.9%	0.3
112	Animal Production	179	294	10.4%	11.7%	8.1%	0.4
113	Forestry & Logging	46	40	-3.1%	-4.0%	-4.9%	0.0
114	Fishing, Hunting & Trapping	0	0	0.0%	142.2%	12.3%	0.0
115	Support for Agriculture & Forestry	13	6	-15.1%	-2.3%	1.1%	0.0
211	Oil & Gas Extraction	3	128	106.6%	-1.7%	-5.7%	0.3
212-213	Mining & Support Activities	748	503	-7.6%	-1.6%	2.9%	0.3
221	Utilities	367	305	-3.6%	-5.4%	-4.9%	0.7
230	Construction	2,717	2,891	1.2%	-3.9%	0.2%	0.8
311	Food Products	14	62	34.5%	-0.2%	0.4%	0.2
312	Beverage & Tobacco Products	0	3	0.0%	2.9%	-0.6%	0.0
313	Textile Mills	0	0	-100.0%	-0.2%	-6.8%	0.0
314	Textile Product Mills	1	2	10.8%	-6.6%	-4.4%	0.0
315	Apparel Manufacturing	83	3	-47.4%	-20.3%	-13.6%	0.0
316	Leather & Allied Products	0	0	-100.0%	-45.2%	-11.5%	0.0
321	Wood Products	82	56	-7.1%	-1.2%	-3.8%	0.1
322	Paper Manufacturing	0	0	-100.0%	-2.0%	-3.6%	0.0
323	Printing & Related Support Activities	54	64	3.5%	-0.8%	-3.6%	0.5
324	Petroleum & Coal Products	0	14	0.0%	16.0%	-2.9%	0.0
325	Chemical Manufacturing	818	1,316	10.0%	-5.7%	-4.5%	1.7
326	Plastics & Rubber Products	23	6	-23.1%	9.1%	-3.0%	0.0
327	Nonmetallic Mineral Products	146	151	0.6%	-4.9%	-2.6%	0.4
331	Primary Metal Manufacturing	1	0	-100.0%	-6.0%	-4.8%	0.0
332	Fabricated Metal Products	535	289	-11.6%	-3.9%	-2.5%	0.6
333	Machinery Manufacturing	98	140	7.3%	-5.5%	-4.7%	1.0
334	Computer & Electronic Products	52	79	8.6%	-5.7%	-5.3%	1.0
335	Electric Equipment, Appliances, etc.	2	4	16.6%	-12.8%	-5.3%	0.0
336	Transportation Equipment	7	5	-5.8%	3.2%	-3.9%	0.0
337	Furniture & Related Products	40	38	-1.2%	0.9%	0.0%	0.0
339	Miscellaneous Manufacturing	76	32	-16.2%	-2.2%	-2.0%	0.0
420	Wholesale Trade	1,137	989	-2.7%	-5.2%	-3.2%	0.6
441-454	Retail Trade	5,912	5,657	-0.9%	-0.8%	-0.3%	0.8
481-487	Transportation	396	419	1.1%	0.7%	1.7%	0.3
491-493	Mail, package delivery & warehousing	230	207	-2.1%	1.3%	6.4%	0.3
511	Publishing Industries (except Internet)	239	271	2.6%	-4.4%	-6.0%	1.0
512	Motion Picture & Sound Recording	62	34	-11.4%	-15.7%	-4.4%	0.0
513	Broadcasting	284	329	3.0%	0.2%	2.9%	0.6
514	Internet & data process svcs	50	189	30.4%	-5.7%	6.1%	4.6
521-523	Monetary, Financial, & Credit Activity	728	724	-0.1%	0.8%	1.8%	0.7
524	Insurance Carriers & Related Activities	343	237	-7.1%	0.2%	-1.2%	0.3
525	Funds, Trusts, & Other Financial Vehicles	19	153	51.3%	3.4%	12.3%	7.5
531	Real Estate	656	1,617	19.8%	8.6%	9.7%	1.6
532	Rental & Leasing Services	164	295	12.5%	7.4%	6.9%	0.8
533	Lessors of Nonfinancial Intangible Assets	7	0	-100.0%	-15.3%	-8.5%	0.0
541-551	Professional Scientific, Technical, Services	1,790	3,310	13.1%	0.9%	7.0%	1.3
561	Administrative & Support Services	1,337	2,444	12.8%	1.7%	0.0%	1.0
562	Waste Management & Remediation	39	50	5.5%	3.5%	8.9%	0.0
611	Educational Services	250	247	-0.2%	-0.7%	0.1%	0.3
621-624	Health Care & Social Services	6,306	9,571	8.7%	2.8%	2.6%	1.4
711-713	Amusement & Recreation	457	413	-2.0%	7.7%	3.7%	0.4
721-722	Accommodations, Eating & Drinking	3,672	4,434	3.8%	1.3%	2.3%	1.1
811-812	Repair, Maintenance, & Personal Services	1,373	2,229	10.2%	3.1%	3.8%	1.1
813	Religious, Civic, Professional, Organizations	578	355	-9.3%	-4.3%	1.4%	0.4
814	Private Households	222	336	8.7%	9.0%	10.1%	0.5
920	Government & non NAICs	12,568	16,700	5.8%	-0.5%	1.0%	1.9
	TOTAL	**45,249**	**57,811**				

Source: EDR-LEAP (with IMPLAN data).

In this four-county region, there are two distinct economic trends – one governing the towns and small cities close to I-79, the other governing the rest of the four-county area. The towns and cities form a swath locally referred to as the I-79 Corridor. Along this corridor, incomes are higher, wages are greater, jobs are growing faster, and the growth industries are primarily those that require high levels of skill and technology to create competitive advantage. The I-79 corridor, in short, is booming. Along this corridor, communities are collaborating with each other to produce growth in technology-based industries, and the primary sites of this growth are Morgantown, in Monongalia County, and Fairmont, in Marion County. The corridor is not, however, taking the rest of the region with it. I-79 is a clear dividing line between the areas of the region that are prospering and those that are not.

In both Monongalia and Marion, the strong concentration in government jobs is due primarily to the presence in Morgantown of West Virginia University and in Fairmont of Fairmont State University and Fairmont State Community and Technical College. And in both counties, the strong service sector is concentrated primarily in business services, engineering services, and computer services- skill-intensive, high-wage industries that are a strong indicator of the region's growth in high-value industries.

It has been years since Monongalia and Marion county depended to any real extent on the mining industries for their economic welfare – in fact, neither county has ever had the level of mining dependence seen in the rest of West Virginia. As the above tables show employment in *Mining & Support Activities* for both these counties has been shrinking at a faster rate than mining jobs in West Virginia. For at least the past ten years, the region's economy has been much more strongly centered on services, retail, and government.

Place-Based Amenities. Like much of West Virginia, Monongalia and Marion counties are abundant with considerable natural beauty. The region's mountains, forests, and rivers combine to create a topography that is unpredictable and striking. Morgantown in particular is starting to build on its riverfront, with walking and biking trails that stretch for miles along the river's edge and culminate in community gathering places close to the city's downtown. Fairmont has not done as much with its riverfront, whose banks are beautiful but still obscured by various retail operations, a few private homes, and other structures; however, plans are being developed to develop the riverfront into a community amenity.

As beautiful as the region is, some of the same factors that create this beauty also contribute to the economic disparities between its rural and metro areas. The mountainous terrain makes it very difficult to move around within the counties – not only making it harder for residents of the counties to reach jobs in Fairmont and Morgantown, but also creating significant infrastructure challenges. Transportation, water and sewer, landfills, construction – all are made very difficult by the rugged topography, with the result that all are in poor condition. Transportation in particular is frequently cited as one of the major challenges of the region outside Morgantown and Fairmont; as Figure 3 below shows, there are virtually no good east-west connectors in

the entire northern half of the state, and the roads that do exist are, to a great extent, old and in disrepair.

The effects of the mountainous terrain are seen not only in the region's infrastructure, but also in its culture. West Virginians are famous for their local orientation; many residents agree that a typical West Virginian identifies with the smallest community possible, thinking of himself not as a resident of a particular county, but of the west side of that county, of a small town within the county, or even of one side of the river in that small town. The topography plays a large role (and reinforces) insularity; because it is so difficult to get from one place to another, residents of towns and communities become used to thinking of themselves as isolated and independent, and resist attempts to connect them with outside communities. While insularity is not necessarily a negative quality –in fact often helping to promote a sense of independence and self-reliance that can be necessary when isolated from external assistance and support – it can make it more difficult to create the kind of regionally coordinated approach that is often necessary for building on place-specific assets to create economic growth that reaches all of the region's citizens.

Labor Markets. Like other aspects of the region's economy, the labor market in the Monongalia – Marion region is an uneven picture. Though unemployment is fairly low throughout the region (4.2 percent, compared to 5.2 for the state and 5.5 for the nation), the region's urban areas have distinctly different labor markets from its rural areas. As discussed earlier, poor transportation infrastructure and the mountainous terrain make it difficult for those outside the urban areas to have access to these job markets. Even in areas where the commute would not be physically difficult, however, there appears to be a strong cultural bias regionwide against commuting. County planners and workforce development directors report that most people in the area expect to drive no more than 10-15 minutes to work, and simply do not tend to consider employment options outside that radius. One exception to this rule, however, is that many of the people filling high-level and technology-intensive jobs in Fairmont live in Morgantown instead and commute to Fairmont, which can't offer the same level of amenities and housing options that Morgantown can. Approximately 9.5 percent of the workforce in Marion County commutes to Monongalia County for work and 7.5 percent of the workforce in Monongalia County commutes to Marion County for work. In fact, one of the key factors hindering the technology-intensive job growth in Fairmont is that it's difficult for employers in these industries to find enough workers.

Educational Institutions. Both Monongalia and Marion have high-performing K-12 school systems; Monongalia's, in fact, was rated by *Offspring Magazine and Expansion Management Magazine* as one of the best public school systems in the country. Exhibit 5-6 displays some recent education statistics for Monongalia County.

Exhibit 5-6. Monongalia County Public School Statistics, 2003-2004

Total Public School Enrollment	10,206
Total Graduates (from three high schools)	691
Average SAT Test Scores (Math)	538
Average SAT Test Scores (Verbal)	538
Pupil/Teacher Ratio	15:1

Source: National Center for Education Statistics, <http:www//nces.ed.gov>; accessed 12/5/2005

As discussed earlier, the region is also home to several excellent post-secondary institutions. West Virginia University in Morgantown is the flagship institution of the state's 14-college state university system. Fairmont State University is a regional public university that merged, a few years ago, with Fairmont State Community and Technical College. The two institutions now operate somewhat independently, but are administrated jointly and coordinate their offerings and outreach activities to ensure that they do not overlap and that where possible they leverage and build on each other. Fairmont State University has focused primarily on its education mission; until now, it has thought of its role in economic development to be primarily educating the workforce that will drive economic growth. The leadership has begun, however, to consider the possibility of becoming involved in research and development and other more industry-focused economic development activities.

Fairmont State Community and Technical College, in Fairmont, is the two-county region's only post-secondary institution of career and technical education. It serves 7,200 students from a wide-ranging service area that covers thirteen of West Virginia's counties (some of which are served by satellite campuses and/or mobile programs). Nevertheless, much of the population of the two-county region lives outside practical commuting range from most of what FSCTC offers, and has little access to postsecondary technical education.

Entrepreneurship. Most of the region's entrepreneurial activity is centered in Morgantown. The university has begun playing a major role, as will be discussed below, in technology-based spin-offs, and the city attracts a considerable number of entrepreneurs who locate their businesses there primarily because it's where they want to live. Many of the entrepreneurs currently doing business in Morgantown say that they located there because the city has a "buzz," an "entrepreneurial energy," that makes it feel like a place where things are happening. The city has a wide range of public and private organizations that support entrepreneurs at all stages; however, these appear to be more an outgrowth of the entrepreneurial activity rather than its cause. The services and support they provide are important to entrepreneurs currently doing business in Morgantown, but they appear to value even more the connections and networks that these organizations, and the people in them, help create. Exhibit 5-7 shows how each of these counties compare to state-level averages for several measures gauging entrepreneurial activity.

Exhibit 5-7 Growth for Self-Employed and Wage Earning Segments of Economy

	Growth # Self-employed 1998-2003	# Self-Emp: Wage Earners	Growth in Income of Self-employed 1998-2003	Growth in Wage Earnings 1998-2003
Marion County	3.0%	1:4	53%	21%
Monongalia County	9.3%	1:6	138%	37%
West Virginia	4.3%	1:5	33%	16%

Source: REIS data and EDR Group calculations

5.3 Evolution of Progress

The two-county region of Marion and Monongalia has seen significant economic improvements over the past five to ten years. Income, employment, educational attainment, and other indicators all tell the story of a region on the rise. Exhibit 5-8 shows the economic indicators for the two counties over 1990 to 2003.

Exhibit 5-8. Economic Trends in Monongalia and Marion Counties, 1990-2003

	Monongalia County			Marion County			West Virginia		U.S.	
	1990	2000	2003	1990	2000	2003	1990	2003	1990	2003
Median household income	$22,183	$28,625	$32,971	$20,386	$28,626	$31,468	$23,147	$32,967	$29,943	$43,318
Median housing value	$64,600	$95,500	n/a	$42,300	$63,600	n/a	$47,900	$85,709	$79,100	$147, 275
%>25 w/ H.S. dipoma	75%	83.6%	n/a	71.4%	79.5%	n/a	66%	78.3%	75.2%	83.6%
%>25 w/ college degress	45%	32.4%	n/a	12.5%	16.0%	n/a	12.3%	17.0%	20.3%	26.5%
Unem-ployment rate	6.6%	4%	4%	11.2%	6%	6%	8.6%	8.4%	5.6%	7.6%
Poverty rate	32%	15.3%	15.3%	16.3%	16.2%	16.2%	16.3%	13.5%	13.1%	12.5%

Source: U.S. Census Bureau, "State and County Quick Facts" >

Differences between these two centers of growth. In this analysis, Morgantown and Fairmont have been singled out from the two-county region as the actual locations of the growth that has been detected at the county level, because the economic trends and dynamics that are producing the growth appear to be at work in these two towns much more than in any other place in either county. Morgantown and Fairmont are much more like each other than either of them is like the rest of their respective counties.

Yet the resemblance between the two places, seemingly so strong when they are viewed in the context of their counties, the larger region, and the rest of West Virginia, fades when the two cities are compared just to each other.

The large student population in Morgantown makes it difficult to find indicators such as income, wage, and employment to demonstrate Morgantown's better position, but reports from stakeholders in both towns confirm that Morgantown has made a leap to a new plane of growth and development that has not occurred (yet) in Fairmont. In fact, more than one stakeholder (including those that are working in and invested in Fairmont's economy) referred to the path of recent prosperity growth as flowing between Morgantown and Harrison County but "hopping over" Fairmont.

One area in which this can be clearly seen is in the level of entrepreneurship and of reinvestment in the community by local entrepreneurs, which is much greater in Morgantown than in Fairmont. The entrepreneurial buzz that is so frequently referenced in descriptions of Morgantown is not mentioned in descriptions of Fairmont – even by those whose job it is to sell the town and its economic assets. Clearly, one major reason for this is that Morgantown has WVU and Fairmont does not – though that is not as clear a reason as it might appear.

The two towns are about a twenty to thirty minutes' drive apart – even allowing for increased travel difficulties at different times of the day and due to inadequate transportation infrastructure, the distance is certainly far less than the informal (and admittedly unscientific) "one day's drive" rule of thumb often observed in the flow of venture capital – i.e., that the majority of funds will flow less than one day's drive away from their source, so that funders can easily keep an eye on their investments. In other words, the distance between the two towns should not be a deterrent to the university's evolving technology development and commercialization relationships with firms in Fairmont. Morgantown must clearly be the primary beneficiary of WVU's economic energy – but shouldn't lower development costs, if nothing else, be encouraging at least some spillover into Fairmont? Why shouldn't university spin-offs be locating in Fairmont, perhaps not just as much as in Morgantown, but at least to a noticeable extent?

Several reasons are responsible. For one thing, Fairmont is working with certain disadvantages that Morgantown is not. One is its degraded physical assets and housing stock. Simply on the basis of its residential real estate offerings, Fairmont cannot compete with Morgantown in the attraction and development of the type of entrepreneur who makes business location decisions based on where he or she wants to live. Less tangibly, Fairmont also is said to be lacking in the entrepreneurial energy, as well as the dense network of connections and resources, that are so important, if hard to quantify, in attracting and growing entrepreneurs.

Fairmont also is described as having relatively undeveloped retail offerings (though, as shown in the entrepreneurship analysis, this may be changing), which both detracts from its attractiveness as a place to live and works against its potential role as a retail

hub for the adjacent counties. According to econometric and spatial analyses, Fairmont should be serving as a center of retail activity for the more rural areas surrounding it that lack a micropolitan areas of their own, and so look to Fairmont for goods and services. Instead, as described above, nearly the opposite is happening. Economic activity, instead of flowing naturally into Fairmont, is "hopping over" Fairmont to get between Morgantown and Harrison County. At one point in its history, about forty years ago, Fairmont *was* serving as a retail center for the region, with a thriving downtown that provided retail, restaurants, services, and other attractions that pulled in consumers from the surrounding rural areas, as well as from Monongalia (including Morgantown, whose retail offerings were limited at that time) and from Harrison County. Then the fateful decision was made to build a mall on the outskirts of town. The mall, quite modest by today's standards, was the first in the region, and effectively killed Fairmont's downtown in a matter of two or three years. By that time, a larger and fancier mall was under construction in Harrison County, drawing business away from Fairmont, and the Mall War, much like those that have been waged in similar communities all over the U.S., was on.

At the same time, the purchasing power of the rural areas that, theoretically, would be looking to Fairmont as a retail center, has been steadily eroding, along with the transportation assets that would facilitate the flow of consumers from the rural areas into Fairmont. (The only truly well-developed transportation route in the region is Interstate 79, which connects throughout the region all the way up to Pittsburgh and beyond – with the result that those in the region willing to travel to find consumer opportunities often simply drive into Pittsburgh, which of course has retail options well beyond anything northern West Virginia has to offer.) Fairmont's retail offerings have been relatively under-invested ever since, to the point where they not only do not attract much business from outside Fairmont but are a detriment to its attractiveness as a place to settle and live. Consequently potential entrepreneurs may be discouraged from locating there not only on their own account, but also because of the increased difficulty of finding, attracting, and keeping talented employees.

Another major difference between the two towns is in the role that federal investment has played in the local economy. Both have been the beneficiary of federal dollars. If anything, Fairmont has received more direct investment than Morgantown, since Congressman Mollohan is focusing primarily on Marion County while Senator Byrd looks at the entire state. In fact, one of the major investments that Senator Byrd secured for West Virginia, the FBI laboratory, was located in Harrison County rather than in Morgantown in order to keep it from being too close to the state border and providing jobs for Pennsylvania residents rather than West Virginians.

It appears, however, that the investments made in the Morgantown area have been parlayed into increased economic capacity, while those made in Fairmont have not. The firms in the Morgantown area that have been the beneficiaries of federal contracts have, for the most part, used the federal work to create or expand their ability to compete in the private sector, while the Fairmont firms are still quite dependent on federal contracts. If the federal investments dried up tomorrow, most of the affected

firms in Morgantown would be able to survive through their private sector work; most or all of the Fairmont firms would close immediately.

This continued dependence on the federal dollars is partly due to the fact that at the time the federal investments started coming in, Morgantown was simply farther along in its economic development path than Fairmont was. There were more assets already in place for the federal dollars to leverage, and the firms already had some experience in competing in the private sector technology-intensive marketplace. The most significant investments in Fairmont were not building on existing technology capacity; many of the firms now working on federal contracts did not exist prior to the federal investment. Being at an earlier stage than Morgantown in its technology development, added to the disadvantages described above, has meant that Fairmont has not yet used its federal dollars to create lasting technology and economic capacity.

A brighter future for Fairmont. There is, however, good reason for optimism regarding future progress in Fairmont. As mentioned above, Fairmont is in an earlier stage of development than Morgantown, and has many strong public and private sector players working to move the town along its development path to a point similar to where Morgantown is now – at which technology, entrepreneurship, and outside investment all converge to create a surge of economic activity. The West Virginia High Technology Center, for example, located in Fairmont and created through federal funds obtained by Congressman Mollohan, works to help technology-based businesses that focus primarily on federal contracts diversify and develop the capacity to compete in the private sector. At the same time, Fairmont's economic development authorities and Chamber of Commerce are thinking about how to parlay the technology-based businesses that have developed as a result of federal investment into more economic growth in other sectors.

One way in which they are already learning from Morgantown's example is in the reinvestment of entrepreneurial wealth into the community. Technology commercialization combined with entrepreneurial energy has produced a great deal of wealth in Morgantown, and the Chamber of Commerce and city planners have been successful in securing some of this wealth as investment in new development in the city. Several new retail, service, and other amenity developments are underway in Morgantown, financed by local entrepreneurs. These developments continue to add to Morgantown's attractiveness as a place to live, work, and invest.

Fairmont stakeholders see the wealth that is being created in its technology-based businesses as a result of federal investment, and know that one of the primary ways in which that wealth can be parlayed into greater overall prosperity for the town is for the entrepreneurs creating the wealth to reinvest in the community. They also know, however, that it is difficult to attract investors to a place that does not appear to be receiving other kinds of investment – not to mention that if they want to create the sort of attachment to place that helps inspire Morgantown's entrepreneurs to invest there, the town itself must work to make Fairmont a place in which entrepreneurs want to live and build. The town is therefore about to start a comprehensive downtown

revitalization project that will create new access to downtown from I-79 (also partly financed through federal funds) and will include riverfront development and retail and street-level renovation as well. The project will address some of Fairmont's primary obstacles to growth: difficulty of access, minimal retail offerings, and undeveloped amenities, and may prove the catalyst that, by improving the town's aesthetic and place-based appeal to its entrepreneurs and other potential investors, will help move Fairmont onto a different trajectory of growth – the one that has brought prosperity to its neighbor and collaborator Morgantown.

5.4 Catalysts of Change

Several notable individuals were identified as connected to growth initiatives in Morgantown and Fairmont, particularly Senator Byrd and Congressman Mollohan for the federal investment that they have brought to the region, and President Hardisty for the focus on technology commercialization that he has brought to West Virginia University.

Even more significant than these key individuals, however, and what makes the region truly distinctive, is the strong network of connections that brings together stakeholders from different realms – the university, the economic development community, the workforce development fields, community planners, the private sector, and others. While it may seem that networks like these exist in all economically dynamic communities, the capacity to connect and collaborate outside the borders of a given identified community is not one that is native to most of West Virginia (though West Virginians are known for fierce loyalty and strong community feeling within the communities they claim as their own).

Earlier, it was described how the state's counties, towns, and communities tend to define themselves inwardly, rather than as part of a larger unit, and to resist connecting with those they consider outsiders. One rather extreme illustration of this point is found in the experience of the Monongalia County officials have made more than one attempt to spread some of the wealth from Morgantown into the rest of the county. The officials met with intense resistance from the county residents, who resented intruders from outside their own communities attempting to influence the path of their development. When the officials persisted, the county residents responded by calling a special referendum and voting to disband the county planning commission. Just as, in resisting commuting, the county's residents resist a geographical connection with Morgantown and other "outsider" communities, they also resist any sort of external planning or development process that might take some control out of their own hands – even if, on their own, they cannot hope to develop very far.

In contrast, Morgantown and Fairmont are part of a vibrant network of collaborators and connectors, entrepreneurs and entrepreneurially minded public sector officials

who include other towns, communities, and counties in nearly every initiative they undertake. In fact, they are much more identified with the I-79 Corridor, and the people and organizations behind it, than they are with the rest of their own counties. This spirit of collaboration was noted by more than one community stakeholder as what truly makes Morgantown, in particular, and Fairmont as well, different from the rest of their respective counties.

5.5 Lessons Learned

One of the most difficult aspects of discerning the lessons learned in a place like Morgantown/Fairmont is separating out the effects of non-replicable advantages, such as large flagship universities and federal investment, and the effects of what has been created here and could be created elsewhere. The most fruitful way to think about it is not to say that every community should have a university and powerful Congressional representation if it possibly can, but rather to hold Morgantown and Fairmont up against comparable communities. There are other communities that have universities, and even some level of federal investment, that do not embark on a tech boom. Given the presence of these advantages, what should a community do with the resources it can control to try to parlay them into lasting economic growth?

First, follow the example of WVU's President Hardisty: **give the university a specific and focused role in local technology commercialization.** Many state and regional universities consider themselves economic assets merely because of the jobs they create or even the technology they deploy and sell; it is the explicit focus and follow-through on the creation of new businesses, or new product lines in existing businesses, that makes WVU not just an economic asset, but an economic driver.

Second, **think and act regionally and in complementary fashion.** Morgantown and Fairmont, alone out of their counties, are thriving; and they alone are connected to communities beyond their own, and show an awareness in their planning of being situated in a regional economic context that has little to do with political borders. While it is the work of years to overturn a community's insular tendencies, a few leaders who are willing to do the uphill work of making the initial connections, and demonstrating the economic power of these connections, especially when each city's economic activity has been focused to complement rather than compete with the other's.

Third, **turn investment into capacity.** By connecting its federal investments with other industries, by using its developing technology expertise and workforce to attract private sector firms and private capital, by assisting federally-invested firms to expand into the private sector market, Morgantown has avoided the dependency trap into which so many recipients of federal investment fall. Fairmont, on the other hand, has yet to make these connections, and is still mostly dependent on its government contracts.

Finally, what do you do if you are the "other" city – the Fairmont, the town that is doing pretty well, considering its context – but receiving less attention than Morgantown, the university city that attracts all the attention, entrepreneurs, new firms, and venture capital? The primary thing is to **assess where your success can fit into the other city's and the region's success**. In Fairmont's case, it is beginning to realize that there are considerable opportunities to be had in supporting and facilitating the economic activity taking place in Morgantown—more than there are in attempting to compete with Morgantown for that activity. For instance, Fairmont is not likely to create another center of commercially-oriented, high-technology research and development. It can, however, create a center of R&D that focuses on technology application and transfer, to complement the R&D being performed in Morgantown, and to foster the growth of businesses that can serve as complements to the high-level technology firms spinning off WVU. Fairmont State University is beginning to examine how it can develop its own R&D capacities to complement those of WVU.

5.6 Interviewees

Charlie Reese, Director, Marion Regional Development Corporation

Bruce McDaniel, City Manager, City of Fairmont

Dr. Dan Bradley, President, Fairmont State University

Blair Montgomery, President, Fairmont State Community and Technical College

Dale Bradley, Assistant Provost of Workforce Development at Fairmont State Community and Technical College

Paul Schreffler, Director of Economic Development and Workforce Education at Fairmont State Community and Technical College

Jim Hall, LDD Director

Don Reinke, Director, Morgantown Area Economic Partnership and Monongalia County Economic Development Authority

Bob McLaughlin, President, I-79 Economic Development Council

Russ Lorince, Director of Economic Development at West Virginia University

Christopher Fletcher, Monongalia county planner

Scott Rostruck, Morgantown Area Chamber of Commerce

Jim Estep, President, West Virginia High Technology Consortium.

Barbara DeMary, Executive Director, Region VI Workforce Investment Board

6 SOUTHEAST TN & SOUTHWEST NC: *RE-TOOLING ASSET-BASED GROWTH*

6.1 Introduction

SE Tennessee/SW North Carolina are covered by two adjacent Local Development Districts that are connected by Appalachian Highway Corridor K. For McMinn County, TN the case study examines the role of entrepreneurship and the arts in maintaining the economic viability of a rural area that has had substantial loss of manufacturing employment. In addition, the case study traces economic development efforts to develop cultural and recreation tourism along Corridor K between Chattanooga, TN and Asheville, NC.

This case study profiles economic development efforts focused on tourism potential in recreation-based and cultural heritage, principally along Corridor K in the Southeastern Tennessee and Southwestern North Carolina located between the metro areas of Chattanooga, TN and Asheville, NC.

This region presents an interesting case study as it spans multiple counties, state, and the Local Development District boundaries. These jurisdictions are competing with each other for employers, workforce, tourists and resources, yet they have organized themselves for economic development as a cohesive unit, pooling resources and efforts to create the critical mass necessary to attain their economic development goals. One reason is that the case study counties are linked by Corridor K – a planned link in the Appalachian Development Highway System (ADHS)

The region is also of interest as a case study because the geographic factors that isolated it also led to the emergence of a regional trade center in Murphy, NC. Finally, the region's natural resources—forests, rivers, railroads, and mines—that were once a source of industrial activity are now being used diversify their economy by building a tourism industry based on recreation and cultural heritage.

6.2 Regional Profile

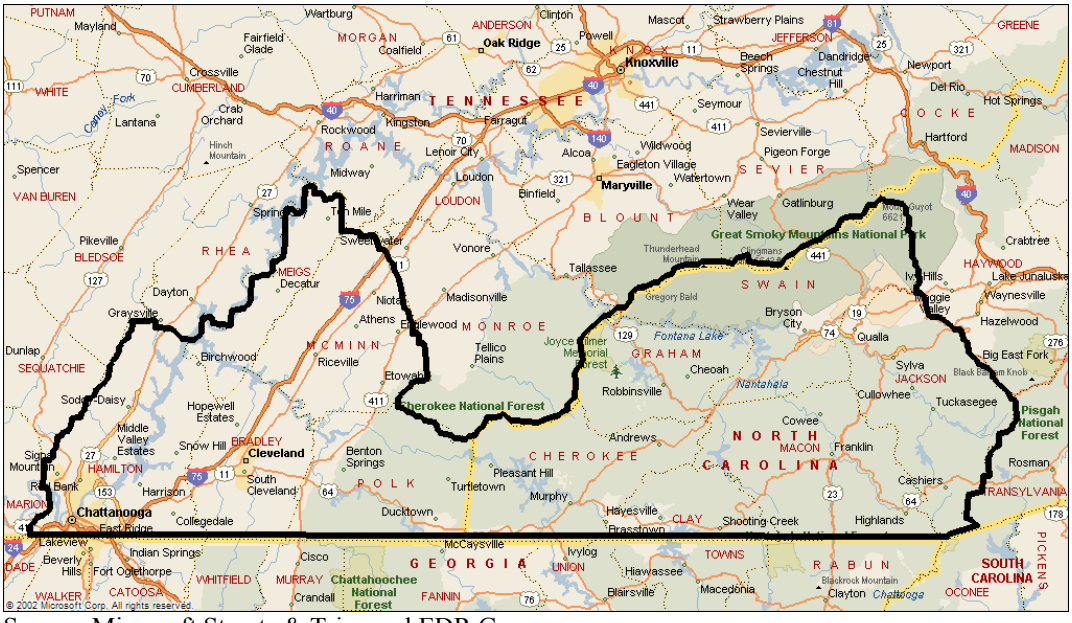
The study area is comprised of counties that are linked by the planned highway of Appalachian Corridor K, including the North Carolina counties of Cherokee, Graham, Jackson, Swain and the Tennessee counties of Bradley, Hamilton, and Polk (Exhibit 6-1). The study area also includes the adjacent counties of Clay and Macon (NC) and McMinn and Meigs (TN) because their economies are closely linked to those located along the corridor (Exhibit 6-2). Though not part of this study, the area also has economic ties to northern Georgia, particularly with Fannin, Union and Towns Counties.

While the counties of interest have a combined population of nearly 589,000, more than half of this is attributable to the Chattanooga metro area. This case study focuses on economic development potential in the non-metropolitan areas east of Chattanooga, TN and southwest of Asheville, NC. This area is isolated from the State capitals, and at one time even harbored an independence movement to succeed from Tennessee, North Carolina and Georgia to form their own state to be called Franklin.

Large portions of the study area are public lands including Cherokee National Forest, Nantahala National Forest, and Hiwassee Lake State Park. For example, Swain County is approximately 87 percent public lands. The region is relatively isolated, ringed in high mountains and bisected by dramatic river gorges.

Exhibit 6-1. Corridor K of the Appalachian Development Highway System

Exhibit 5-2. Map of the Full Case Study Area



Source: Microsoft Streets & Trips and EDR Group

Originally home to the Cherokee and vibrant early-American trade paths, the region has been populated since before the 1700s. In the 1820s, gold was discovered and in the 1840s copper was discovered. The copper mining industry in particular drove boom-town style growth. Railroads were constructed to serve the mining industry, which allowed the logging and textile industries to flourish. The textile industry remained strong until the late 1980s when the national textile industry began to experience significant losses as the industry shifted to lower-cost manufacturing in China. The furniture industry, which had grown out of the region's logging activities, remained strong until the last decade when this industry also went abroad.

Population Growth. Exhibit 6-3 presents population in each of the study area counties for the past four decennial Censuses. The largest county by far is Hamilton, TN (pop. 307,896), which includes Chattanooga. Bradley and McMinn Counties also have relatively large populations, while Graham and Clay have populations under 9,000. During the 1990s, population growth in three of the six North Carolina counties outstripped that of the state as a whole, while three of the five Tennessee counties surpassed the rate of growth statewide.

Exhibit 6-3. Population and Population Growth

	Population				% Change			
Population by County	**1970**	**1980**	**1990**	**2000**	**1970-80**	**1980-90**	**1990-2000**	**1970-2000**
Hamilton County, TN	256,190	288,370	285,536	307,896	13%	-1%	8%	20%
Bradley County, TN	51,230	67,770	73,712	87,965	32%	9%	19%	72%
McMinn County, TN	35,600	42,030	42,383	49,015	18%	1%	16%	38%
Jackson County, NC	21,593	25,811	26,846	33,121	20%	4%	23%	53%
Macon County, NC	15,910	20,380	23,499	29,811	28%	15%	27%	87%
Cherokee County, NC	16,410	18,990	20,170	24,298	16%	6%	20%	48%
Polk County, TN	11,720	13,650	13,643	16,050	16%	0%	18%	37%
Swain County, NC	8,835	10,283	11,268	12,968	16%	10%	15%	47%
Meigs County, TN	5,250	7,450	8,033	11,086	42%	8%	38%	111%
Clay County, NC	5,200	6,660	7,155	8,775	28%	7%	23%	69%
Graham County, NC	6,560	7,210	7,196	7,993	10%	0%	11%	22%
State of Tennessee	3,926,018	4,591,120	4,877,185	5,689,283	17%	6%	17%	45%
State of North Carolina	5,082,059	5,881,813	6,628,637	8,049,313	16%	13%	21%	58%

Source: US Census Bureau.

Economic Profile. Exhibit 6-4 presents employment trends by NAICS sector in the study area for 1997 and 2002. The top three sectors across both years are government, retail trade, and health care/social services which is typical for many areas in the nation, particularly under-performing areas such as those found in Appalachia. *Accommodations, eating & drinking* is the fourth largest source of employment, and is important to regional tourism. Construction is fifth, which is supported by the pace of second-home construction discussed later in this case study. Transportation is sixth, which reflects the presence of Interstate 75 at the western edge of the study area, a major east coast north-south trade corridor.

Exhibit 6-4. Employment by Industry, 1997-2002

		Study Area			Annual Growth		2002 LQ
NAICS	Sector	1997	2002	Annual Growth	TN & NC Combined	United States	Study Area/ TN & NC
524	Insurance Carriers & Related Activities	10,147	14,241	7.0%	-0.3%	-1.2%	2.7
335	Electric Equipment, Appliances, etc.	5,703	6,612	3.0%	-4.2%	-5.3%	2.5
325	Chemical Manufacturing	4,349	8,355	13.9%	-3.0%	-4.5%	2.4
311	Food Products	8,413	9,373	2.2%	1.4%	0.4%	2.2
481-487	Transportation	10,344	20,878	15.1%	1.1%	1.7%	2.2
322	Paper Manufacturing	3,268	3,765	2.9%	-1.3%	-3.6%	2.0
114	Fishing, Hunting & Trapping	23	552	88.4%	44.1%	12.3%	1.9
331	Primary Metal Manufacturing	3,887	1,570	-16.6%	-7.3%	-4.8%	1.8
813	Religious, Civic, Professional, Organizations	6,751	6,781	0.1%	-1.6%	1.4%	1.3
212-213	Mining & Support Activities	328	455	6.8%	-3.6%	2.9%	1.2
315	Apparel Manufacturing	6,328	2,707	-15.6%	-17.2%	-13.6%	1.2
441-454	Retail Trade	45,460	45,340	-0.1%	-0.4%	-0.3%	1.1
333	Machinery Manufacturing	4,095	3,218	-4.7%	-3.3%	-4.7%	1.0
339	Miscellaneous Manufacturing	1,913	1,589	-3.6%	-3.7%	-2.0%	1.0
491-493	Mail, package delivery & warehousing	3,675	5,944	10.1%	8.3%	6.4%	1.0
531	Real Estate	7,100	9,913	6.9%	8.2%	9.7%	1.0
541-551	Professional Scientific, Technical, Services	17,006	21,846	5.1%	7.3%	7.0%	1.0
721-722	Accommodations, Eating & Drinking	23,510	26,377	2.3%	2.6%	2.3%	1.0
811-812	Repair, Maintenance, & Personal Services	9,912	12,883	5.4%	4.9%	3.8%	1.0
113	Forestry & Logging	811	423	-12.2%	-7.3%	-4.9%	0.9
221	Utilities	1,005	747	-5.8%	-9.0%	-4.9%	0.9
230	Construction	26,505	22,965	-2.8%	-0.7%	0.2%	0.9
332	Fabricated Metal Products	4,003	3,486	-2.7%	-1.5%	-2.5%	0.9
532	Rental & Leasing Services	1,148	1,908	10.7%	7.6%	6.9%	0.9
621-624	Health Care & Social Services	27,790	29,153	1.0%	2.7%	2.6%	0.9
814	Private Households	1,886	3,646	14.1%	11.0%	10.1%	0.9
920	Government & non NAICs	44,422	47,674	1.4%	1.4%	1.0%	0.9
112	Animal Production	2,269	2,659	3.2%	4.9%	8.1%	0.8
323	Printing & Related Support Activities	2,130	1,420	-7.8%	-4.0%	-3.6%	0.8
337	Furniture & Related Products	4,676	3,160	-7.5%	-4.3%	0.0%	0.8
420	Wholesale Trade	14,036	11,800	-3.4%	-2.6%	-3.2%	0.8
521-523	Monetary, Financial, & Credit Activity	6,053	6,797	2.3%	2.3%	1.8%	0.8
561	Administrative & Support Services	20,388	18,300	-2.1%	1.1%	0.0%	0.8
562	Waste Management & Remediation	895	533	-9.8%	1.0%	8.9%	0.8
611	Educational Services	3,212	4,098	5.0%	1.9%	0.1%	0.8
711-713	Amusement & Recreation	4,709	5,320	2.5%	4.9%	3.7%	0.8
312	Beverage & Tobacco Products	1,135	842	-5.8%	-1.3%	-0.6%	0.7
313	Textile Mills	3,199	2,908	-1.9%	-8.6%	-6.8%	0.7
336	Transportation Equipment	1,683	3,123	13.2%	-2.5%	-3.9%	0.7
512	Motion Picture & Sound Recording	647	414	-8.6%	-7.1%	-4.4%	0.6
513	Broadcasting	1,717	1,762	0.5%	2.8%	2.9%	0.6
321	Wood Products	1,398	1,110	-4.5%	-5.3%	-3.8%	0.5
326	Plastics & Rubber Products	2,078	1,583	-5.3%	-2.4%	-3.0%	0.5
327	Nonmetallic Mineral Products	1,602	751	-14.1%	-3.6%	-2.6%	0.5
511	Publishing Industries (except Internet)	1,463	927	-8.7%	-4.6%	-6.0%	0.5
111	Crop Production	2,377	1,598	-7.6%	-4.3%	-2.9%	0.4
314	Textile Product Mills	1,752	384	-26.2%	-5.5%	-4.4%	0.4
334	Computer & Electronic Products	189	932	37.6%	-4.6%	-5.3%	0.4
115	Support for Agriculture & Forestry	272	219	-4.2%	10.4%	1.1%	0.0
211	Oil & Gas Extraction	120	0	-100.0%	40.5%	-5.7%	0.0
316	Leather & Allied Products	283	177	-9.0%	-15.5%	-11.5%	0.0
324	Petroleum & Coal Products	48	208	34.2%	4.4%	-2.9%	0.0
514	Internet & data process svcs	196	242	4.3%	15.7%	6.1%	0.0
525	Funds, Trusts, & Other Financial Vehicles	172	27	-30.9%	4.9%	12.3%	0.0
533	Lessors of Nonfinancial Intangible Assets	58	41	-7.0%	-2.9%	-8.5%	0.0
	TOTAL	**358,539**	**383,736**	**7.0%**			

Source: EDR-LEAP (with IMPLAN data) and EDR Group.

As shown in Exhibit 6-4, the region's major manufacturing sectors include food products, chemical manufacturing, electrical equipment and appliances, furniture, paper, textiles, apparel, fabricated metal products, machinery, and transportation equipment.

Despite losses between 1997 and 2002 in historically important sectors such as textile mills, apparel manufacturing, forestry and logging, furniture and wood products, and mining, the region experienced a net gain of more than 25,000 jobs. The computer and electronic products industry grew from under 200 employees to nearly 1,000 and other large gains occurred in the transportation services, chemical manufacturing, transportation equipment manufacturing, and package delivery & warehousing industries.

The last column of Exhibit 6-4 also shows the 2002 location quotients (LQ) for the study area. In comparison to the employment mix of Tennessee and North Carolina combined, the study area has particularly high shares of employment in insurance, electric equipment and appliance manufacturing, chemical manufacturing, food products and transportation. The region also has relatively higher shares of employment in paper manufacturing, fishing/hunting/trapping, primary metal manufacturing, mining, apparel manufacturing, apparel manufacturing, furniture manufacturing, and mining. These industries reflect historical strongholds of the region.

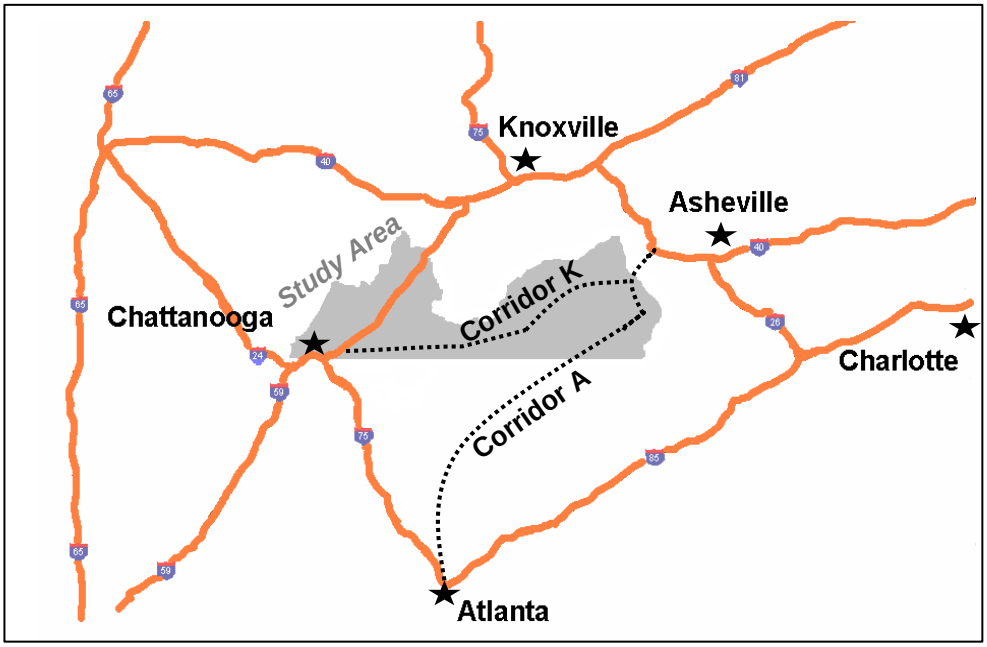
Regional Connections. One of the most notable features of the region is the lack of connection between Chattanooga and Asheville/Charlotte (Exhibit 6-5). Currently, the trip from Chattanooga to Asheville involves a five-hour, 230 mile journey around Great Smoky Mountains National Park through Knoxville on I-75 and I-40. An alternative route runs through Cherokee and Nantahala National Forests, a 200-mile journey taking nearly six hours. This second route along Corridor K involves several stretches of modern 4-lane divided highway, however in two key spots along the Ocoee and Nantahala Gorges, the road narrows to just two lanes, so that trucks must sometimes maneuver into oncoming traffic to negotiate tight curves. During the summer months, the route becomes congested with tourists flocking to rafting, mountain biking, hiking and other recreational activities in the two gorges.

Traditionally, Chattanooga was the industrial anchor of the region, connected to Cincinnati and Atlanta via I-75 and to Nashville via I-24. Murphy, NC also developed an industrial concentration, and has a highway connection south to Atlanta. However, the region has weak east-west linkages, which economic development leaders see as a barrier to business attraction and job growth. In particular, it is seen as limiting access to East Coast international trade and European market connections.

Economic development leaders in the region have identified the potential for job growth and economic benefits for Chattanooga; increased commerce between Chattanooga and points east; and the opportunity for Murphy and Sylva, NC to tie into the I-65 "Auto Parts Alley" as likely outcomes of improved east-west connection and

improved linkages to the Interstate Highway system. Though regional leaders see Chattanooga experiencing the greatest benefits from such improved connections, they expect positive spillover effects to occur throughout the region.

Exhibit 6-5. Study Area Interstate and Highway Connections



6.3 Evolution of Progress

Despite the region's relative isolation and manufacturing losses which parallel those that have occurred in the national economy, the region has experienced some economic development success by fostering its tourism industry, and building on manufacturing assets to recoup a portion of jobs lost.

Tourism. The study area is outside of higher profile tourist areas near Asheville such as the Great Smoky Mountains and Blue Ridge Parkway. However, as the tourism industry has shifted away from more traditional types of outdoor recreation based on relaxation and visual beauty toward more active forms of recreation such as hiking, rafting, mountain biking and so-called "ultimate sports", the region has been able to capitalize on its outdoor and cultural heritage assets. For example, Cherokee County Chamber of Commerce has changed its strategy from promoting "Peace in the Mountains" to promoting "Fun in the Mountains". Regional outdoor recreation, cultural heritage, and second-home market assets are described below. Later ections describe how regional leaders have cooperated to develop and promote these assets.

Outdoor Recreation. Outdoor recreation assets include the challenging class IV rapids of the Ocoee River, which was the site of the 1996 Atlanta Olympic Games. The Nantahala River has class II and III rapids which are less challenging and more oriented towards beginner and intermediate rafters (though Ocoee outfitters offer trips that do not require previous rafting experience). Local companies also facilitate outdoor activities including hiking, mountain biking, horseback riding, fishing, hunting, rock climbing and repelling, water skiing, llama trekking, hang gliding, and bird-watching, though many of these activities can also be done by individuals on their own. Outdoor attractions include the Unicoi Turnpike Trail, Benton-MacKaye Trail, Appalachian Trail, Lost Sea cavern and underground lake, and Cherohala Skyway.

Cultural Heritage Tourism. In addition to outdoor recreation amenities, the region is rich in cultural heritage sites and activities. The region is crisscrossed by 1,000 year old trade passages, steeped in Native American history, and has many remnants of the Industrial Revolution. Organizations such as the Tennessee Overhill Heritage Association (discussed below) are working to restore, revitalize, and interpret these cultural heritage amenities to attract visitors, increase visitor spending, and contribute to the region's economic base. Cultural heritage attractions include the John C. Campbell Folk School, Sequoyah Birthplace Museum, Ducktown Basin Museum, L&N Depot and Rail Museum, McMinn County Living Heritage Museum, Swift Museum (Globe and Temco Swift airplanes), Englewood Textile Museum, Mason's Corn Maze, and Fields of the Wood Bible Park.

Second Home Market. In recent years, the region has experienced a surge in second home construction. In fact, Murphy, NC recently appeared on Forbes list of emerging second home markets. This is seen as a positive development as seasonal residents demand very little of municipal services while contributing to the local economy through dining, entertainment, health care, property taxes and other expenditures.

Recently, the completion of Corridor A to the east of the study area has improved the region's connection with points east, which has fanned the second home market in counties toward the eastern end of the study area. In fact, several area towns double in population during the summer as city-dwellers primarily from Florida and Georgia escape to their vacation homes. In some areas, the pace of growth is beginning to generate concerns of gentrification, though there has not yet been a movement for zoning or land use restrictions most areas. A zoning referendum recently put to voters in McMinn County was defeated. The more isolated counties such as Polk and Cherokee have not yet experienced the same pace of growth, thus there has been little interest in regulation.

Building Critical Mass. Many of the region's tourism assets have traditionally drawn either from a day-trip market or catered to very specialized interests such as bird watchers or crafts enthusiasts. In a later section, this case study shows how regional organizations are working together to expand their offerings and bundle them in a way that transforms the region from a local attraction drawing from adjacent areas into a major tourist area drawing overnight visitors from throughout the southeastern US.

Industry and Trade Center. Throughout the region's history, its topography reinforced regional cohesiveness. The high mountains that ring the region create a "bowl" around the Tennessee county of Polk, North Carolina counties of Cherokee and Clay, and Georgia counties of Fannin, Union (GA) and Towns (GA), with Cherokee County at the center. This bowl, together with highway connections centered on Cherokee County, made the county a natural regional trade center (Exhibit 6-6A-B.) Though the county itself has a population of only about 24,300, the market area population is approximately four times that. As evidence of Cherokee County's role as a trade center, in 2005 the county ranked 71st in population but 20th in per capita retail sales among the state's 100 counties. Most of this activity takes place in Murphy, the county's largest city.

Exhibit 6-6A Topography Defining the Murphy, NC Trade Center

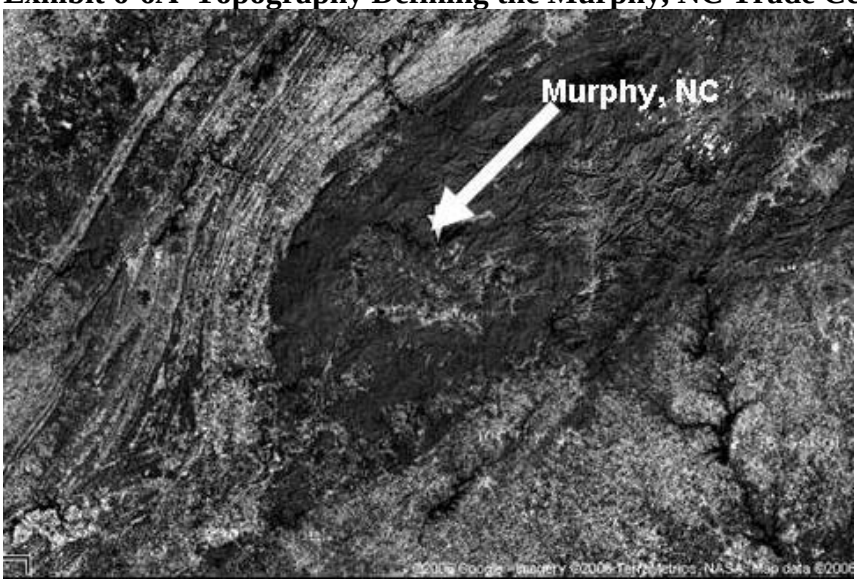
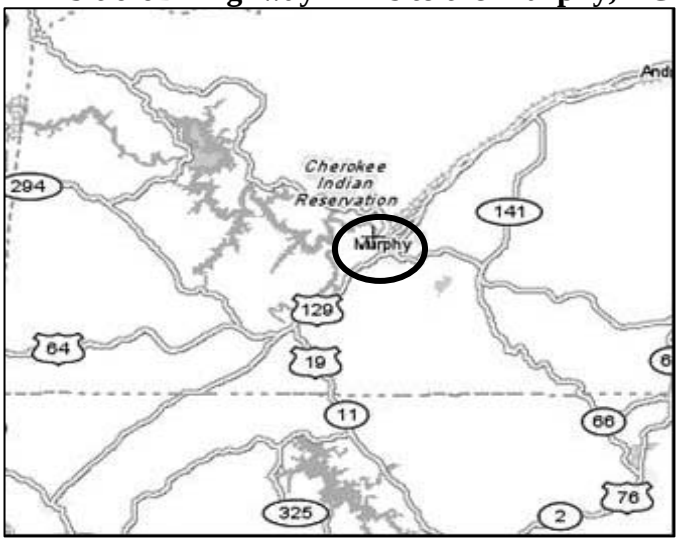


Exhibit 6-6B Highway Links to the Murphy, NC Trade Center



In addition to creating a retail trade center, topography and highways supported a natural labor market. This labor market combined with metals from the mining industries, and extensive railroad connections, fostered significant manufacturing activity that would have been unlikely without this labor market. Despite manufacturing losses that mirror those experienced in the nation as a whole, the region has a strong presence of metal fabrication and machine and equipment manufacturing. Major companies in Murphy include MGM Brakes, Moog Components and Sioux Tools.

Though much of the economy is in transition toward tourism, regional leaders are still pursuing industrial development to ensure that the regional economy stays balanced and includes jobs with health care and retirement benefits. Through industrial recruitment efforts, the region has been able to regain about half the manufacturing jobs lost due to the relocation of the textile and furniture industries.

Industrial recruitment is primarily achieved through networking with companies familiar with the area. Though Murphy has connection south to Atlanta in which the journey is all interstate after the first seven miles, industrial recruitment efforts are still challenged by the perception of greater transportation access difficulties going east or west. This is compounded when business prospects arrive via alternative routes through narrow, winding, mountain roads. Furthermore, though there is an abundance of flat land suitable for industrial sites, outsiders often harbor the perception that the entire region is mountainous.

While Corridor K will help to address the access problem, for now much of this area is poorly connected to both Asheville and Chattanooga. The lack of access is felt to substantially reduce the representation of auto parts related industry in the region, though that could change if future highway improvements better link it to the "Auto Alley" of parts and assembly plants located along I-75. At the other end of the study area, an improved connection with Ashville would also connect the area to Charlotte, which is a key location for export-oriented industries.

6.4 Catalysts of Change

The study area spans several County, State and Local Development District boundaries. Though these jurisdictions are competing with each other for jobs, workforce, tourists and resources, they have organized themselves for economic development as a cohesive unit, pooling resources and efforts to create the critical mass necessary to attain their economic development goals.

Local Development Districts. The study area spans the jurisdiction of two Appalachian Regional Commission (ARC) Local Development Districts (LDDs), the Southeast Tennessee Development District and Southwestern North Carolina Planning

and Economic Development Commission. In addition to addressing their local responsibilities, they have also created a partnership organization, the Southeast Industrial Development Association (SEIDA), which has been a catalyst for the region's major economic development efforts.

Southwestern North Carolina Planning and Economic Development Commission. This LDD encompasses North Carolina's seven western-most counties and addresses housing and community development, land and water conservation and preservation, transportation planning, infrastructure, workforce development, and education. The organization also operates a revolving loan fund to promote access to capital for local businesses.

Southeast Tennessee Development District. The Southeast Tennessee Development District covers a 12-county service area which includes three Georgia Counties (Dade, Walker, and Catoosa). The organization encompasses 11 functional areas: Aging and disability planning, regional planning, utility development, tourism development, housing development, industrial recruitment and marketing, transportation planning, economic development, recreation and cultural resources, solid waste and natural resources and workforce development.

The LLD operates as part of a consortium called the Southeast Development Resource Group, which includes the Chattanooga Area Regional Council of Governments, Southeast Tennessee Local Development Corporation, and several other business, industrial and community development agencies all of which are staffed and administered by the LDD. The LDD also staffs and operates SEIDA, which has been a powerful force for regional economic development.

Southeast Industrial Development Association. The Southeast Industrial Development Association (SEIDA) is a unique example of cross-jurisdictional cooperation. The organization is comprised of the economic development arms of the Tennessee Valley Authority (TVA) power districts in Tennessee, North Carolina and Georgia as well as three regional LDDs— Southeast Tennessee Development District, Southwestern North Carolina Planning and Economic Development Commission, and the Coosa Valley Regional Development Center (Georgia). These three organizations contract with the Southeast Tennessee Development District to staff and administer SEIDA programs and initiatives. In turn, SEIDA promotes and coordinates industrial development and tourism initiatives in the region.

Three decades ago, the organization laid out a comprehensive plan for regional economic development with 10 functional areas and capital budgeting. Preservation of the region's natural resources was a key element of the strategy, and the organization has been involved in land swaps that have allowed large tracts of land to remain pristine and undisturbed while preserving the natural beauty of recreation lands and facilitating industrial development on less sensitive areas.

According to local economic developers, the willingness of local leaders to work together emerged several decades ago through participation in ARC project prioritization exercises. Rather than seeing themselves as leaders of individual counties, they see themselves as regional leaders. They are comfortable promoting projects outside of their own jurisdiction because they recognize that they will benefit either as "the rising tide lifts all boats" or simply because working together provides the critical mass necessary to fund and execute projects that each county alone could not.

In terms of tourism promotion, regional leaders have realized that outdoor recreation is a given, thus their focus is on extending the season beyond the Memorial Day-Labor Day period ("add shoulders to the season"), extending stays (adding room nights and meals), and promoting activities that generate revenue ("make the cash registers ring").

One strategy to achieve these goals is water releases on the upper Ocoee River. Currently, the river has approximately 120 days of water on the lower portion which is long enough for half-day rafting excursions. Releases into the upper portion of the Ocoee River would allow for full-day rafting trips. Half-day rafting trips draw visitors from about a 150-miles radius, whereas full-day excursions draw from beyond that and encourage overnight stays even from visitors from within the current market area, as a full day of rafting is physically taxing. After a long, complicated planning process, SEIDA was able to borrow $1.1 million to buy water from TVA for release into the upper Ocoee River for 34 of the existing 120 days. SEIDA has signed long-term contracts with rafting outfitters wishing to operate on the upper Ocoee, and will repay the loan using fees collected from these outfitters.

Tennessee Overhill Heritage Association. One successful example of cross-jurisdictional cooperation for tourism development is the Tennessee Overhill Heritage Association, which focuses on McMinn, Monroe, and Polk Counties in Tennessee. SEIDA formed this organization in 1990 as a pilot through the National Trust for Historic Preservation's Heritage Tourism Initiative. During that period, the development of I-75 just west of the study area had shifted manufacturing away from the McMinn, Monroe, and Polk Counties and towards the I-75 corridor. Around the same time, there was a reduction in the amount of timber allowed to be cut, drastically limiting a major source of local government revenues.

Regional leaders realized the need to diversify their economic development strategy to include more emphasis on cultural heritage tourism. Tennessee Overhill was created to jointly market the region's small museums with the idea that though each individual museum would not attract many overnight visitors, together they would form enough of an attraction to draw from a larger overnight market. Within the first year, the need to include the region's recreation and outdoor assets became apparent. At the end of the three-year pilot, the organization became permanent, receiving operational support from the three county governments, City of Etowah, and special projects support through grants, donations and earned income.

Tennessee Overhill is unique in several ways. First, it does not operate on a "pay to play" basis which requires attractions to pay to be included in marketing efforts. Instead, Overhill considers each attraction's contribution to area hotels, restaurants and shops and its role as a piece of the whole tourism experience. Second, rather than a blanket marketing campaign, Overhill advertises in less expensive and more targeted venues, such as birding and whitewater rafting publications. Finally, cultural heritage travelers are not motivated by a list of an area's attractions. Instead, they are looking for content and interpretation, which Overhill brochures, publications and website provide.

The organization's major outdoor initiative is the rehabilitation of the 40-mile Old Line Haiwasee River Gorge Rail Road and operation of passenger excursions. This railroad used to serve a major copper mine operated by Tennessee Minerals, LLC that has since left the region. As the line was no longer in use, CSX planned to dismantle it. Seeing an opportunity to preserve a piece of the region's history and offer passenger excursions through otherwise inaccessible wilderness, SEIDA negotiated acquisition of line from CSX and entrusted it to Tennessee Overhill. Before acquiring the railroad, SEIDA and Overhill invited a team from the National Forest Rails to Trails program to inspect its condition, and the team found that if necessary the materials could be salvaged with minimal invasiveness, leaving the bridges and surrounding landscape in tact. This provided SEIDA and Overhill with the confidence of a "plan B" in the event that it was not profitable.

SEIDA also oversaw an ARC-sponsored feasibility study which determined that the line would need to run approximately 500 cars of freight in addition to passenger excursions to remain profitable. Some 10 million tons of iron oxide, commonly called calcine and recognizable as rust remain on the former mine site, and Tennessee Minerals has decided to sell it to "pig iron" manufacturing operations in China. Thus, Glenn Springs Holdings, a wholly owned subsidiary of Occidental Petroleum charged with the environmental remediation of the former mine, restored the tracks to the point that they could carry the freight. The company then entered a contract with Overhill for use of the tracks for cargo and in 2005, the first eight trainloads were shipped out. The contract also preserved the right for Overhill to operate passenger excursions, which will consist of shorter trips to the Appalachia Powerhouse, the Bald Mountain Loop, and a few full-day excursions to the Copperhill mine.

The organization sees potential for future tourism development associated with the Benton-MacKaye trail, a 300 mile footpath between Springer Mountain in Georgia to Davenport Gap on the northern edge of the Great Smoky Mountains National Park through isolated backcountry and numerous federally designated Wilderness and Wilderness Study Areas. Overhill has observed that there are numerous cultural and historic points of interest along the trail that could be further developed and promoted.

Southeast Tennessee Tourism Association. Another entity staffed and administered by the Southeast Tennessee Development District is the Southeast Tennessee Tourism

Association, which markets the region as a visitor destination. Recently, the organization embarked upon an interesting project to promote the region's diverse religious heritage. In 2005, the organization secured a $60,000 relief grant from the Economic Development Administration to help the region overcome damage done by a severe infestation of Southern Pine Beetles that hit two key regional industries, logging and agriculture.

The organization used the funds to hire a consultant from the National Trust for Historic Preservation to identify regional assets. The consultant identified the opportunity for the development of a religious heritage trail, which would capitalize on the region's diverse religious history. The concept was well received by the public, and the concept has been developed into the "Glory Land Road". The self-guided trail features the courthouse where the "Scopes Monkey Trial" took place; a Holocaust Museum in Whitwell; Beth Salem, a historic black church in McMinn County; the Brainerd Mission in Chattanooga where Cherokee Indians were converted to Christianity; and Our Lady of the Poor Shrine in Marion County which is a replica of a famous church in Belgium where the Virgin Mary is said to have appeared. The Tourism Association estimates that the region draws approximately 60,000 to 80,000 visitors each year for religious events and conferences, and the Religious Heritage Trail is designed to lengthen their stay, generate return visits, and increase expenditures.

Among other efforts, the organization also publishes the *Outdoor Recreation Guide*, *Shopping Guide to the Art Trails*, and *Out to The Farm Agritourism Guide,* all of which string smaller attractions together into a more comprehensive experience.

Coker Creek Economic Development Group. CCEDC provides an example of a local economic development organization's tourism promotion efforts. Coker Creek, Tennessee is surrounded by National Forest and is cut off from industrial development alternatives by Tellico Mountain on the North, Farner Mountain on the south, Unicoi Mountain on the east, and Cataska mountain on the west. Despite a lack of manufacturing, the area is rich in craft and folk art tradition, and the Coker Creek Economic Development Group (CCEDG) was initially formed to preserve and pass on these traditions to local residents. The organization found that outsiders were also interested in learning folk art traditions, and now craft workshops include visitors from Georgia, Florida and other areas. CCEDG operates the local post office which is adjacent to the organization's Welcome Center and arts and crafts retail space.

Barriers to Cooperation. Though the organizations discussed above have coordinated to overcome jurisdictional barriers to economic development, some difficulties remain. The State tourism bureaus of Tennessee, North Carolina, and Georgia have resisted funding cross-jurisdictional marketing efforts. A result is that though tourists consider the region a contiguous recreation area, there are separate guide materials for each of the three states.

The State transportation departments also lack mechanisms for working together, which has challenged the region's efforts to improve transportation connections.

Priorities for the Future. Regional economic development leaders are virtually unanimous regarding the region's leading economic development priority, and that is the completion of Corridor K. Corridor K is part of the Appalachian Development Highway System (ADHS) authorized by the Appalachian Development Act of 1965. As a whole, the ADHS encompassed more than 3,000 miles of highway necessary to connect Appalachia with economic development opportunities, and to date 85 percent of the system has been completed. Corridor K is one of the last remaining pieces of the system. Though the final alignment has not yet been determined, Corridor K would run from I-75 near Cleveland, Tennessee to Corridor A near Sylva, North Carolina, resulting in a direct connection from Chattanooga to Ashville (and consequently, Charlotte).

The North Carolina portion of Corridor K has already gone through the Environmental Impact Study (EIS) process and been approved. The Tennessee portion has been more contentious, however. The initial alternatives considered by the EIS received heavy criticism because among other concerns, the alignments included several bridges over the Ocoee River which stakeholders felt would detract from the natural beauty of the Gorge as well as the river rafting experience. A second alternative that cut expensive passes and tunnels through the mountains was rejected due to its billion dollar price tag.

A second regional priority, which is primarily relevant to the western end of the study area is the potential for a high speed rail connection from Chattanooga to Atlanta. Atlanta is a major airline hub and hosts the headquarters of numerous major companies. The two metropolitan areas already have strong economic ties, but increasing traffic congestion around Atlanta is limiting further integration of the two economies. A high speed rail connection would mitigate the barrier of traffic congestion by allowing tourists, businesspeople and residents to move more freely between the two regions.

6.5 Lessons Learned

1. Cross-Jurisdictional Planning, Coordination and Implementation **-** Potential employers and tourists alike view the study area as a region, rather than a collection of counties spanning multiple states. If regional leaders insisted upon marketing only their own individual tourist attractions and improving business conditions and transportation linkages only within their own jurisdictions, they would lack the critical mass needed to draw overnight tourists, and create and retain jobs in key industries. By creating an organization that rewards county leaders for thinking and acting like regional leaders (SEIDA), they have been able to better leverage resources from their

respective states and raise the profile of their tourism assets to create a destination for overnight visitors who come to the are from a greater distance than the day trippers.

2. Understanding that Tourism Preferences are Changing **-** Just as the manufacturing sector has changed over the past several decades, the tourism sector is changing as well. Tourism once centered on relaxation and natural beauty. Two key emerging trends are eco-tourism and cultural heritage tourism, which reflect a preference for activity-based vacations. Thus the industry is shifting away from "one size fits all" attractions and toward those that allow visitors to create a more tailored, specialized vacation experience.

Regional efforts are helping ensure that local tourism attractions cater to these new preferences. Tennessee Overhill efforts such as "Furs to Factories Heritage Area: Exploring the Industrial Revolution in the Tennessee Overhill" and "From Native Gardens to Cheese Farms: AgriCulture in the Tennessee Overhill" string together individual attractions into a more unified, complete experience.

3. Sheer Creativity **-** This case study illustrates the importance of creatively using one problem to leverage a solution for another. For example, the concept for the "On the Glory Land Road" religious heritage trail emerged from a National Trust for Historic Preservation study funded by monies apportioned by TVA as relief from a devastating infestation of Southern Pine Beetles.

Another example was the acquisition of the Old Line Haiwasee River Gorge Rail Road by the Tennessee Overhill Heritage Association through SEIDA. The closure of the mine could have been a net loss for the region, but instead it is being used as a recreation asset and generating earned income through cargo shipments.

4. An Asset-Based Economy Depends on Market Access. Though the region has managed to assemble a unique and diverse selection of tourism offerings, regional leaders recognize that their ability to fully capitalize on them depends upon transportation access. Expansion beyond the day trip market and attracting visitors from throughout the southeast depends on safe and efficient highway linkages to the southeast's major metropolitan areas and tie-ins with the Interstate Highway system.

6.6 Interviewees

Hale Booth, Executive Director, Southeast Tennessee Development District

Linda Caldwell, Executive Director, Tennessee Overhill Heritage Association

John Carringer, Manager, Murphy Electric Power Board

Vicki Greene, Director of Planning and Development, Southwestern North Carolina Planning and Economic Development Commission

Bill Gribson, Executive Director, Southwestern North Carolina Planning and Economic Development Commission

Joe Guthrie, Manager, Southeast Local Development Corporation

Larry Kernea, Assistant Manager, Murphy Electric Power Board

Sandra H. Kimball, Executive Director, Cherokee County Chamber of Commerce

Hoyt T. Firestone, County Executive, Polk County

Bill Forsyth, Executive Director, Cherokee County Economic Development Commission

Beth Jones, Deputy Director, Southeast Tennessee Development District

Larry Mashburn, President, Ocoee Adventure Company

Delos Monteith, Institutional Research and Planning Officer, Southwestern Community College

Barbara Palmer Vicknair, Vice-Chairman (District 2), Cherokee County Board of Commissioners

7 ALABAMA: *AUTO ALLEY*

7.1 Introduction

Alabama provides a state-level case study that traces how Alabama's automotive-related manufacturing activity (initiated by attracting Mercedes-Benz to Tuscaloosa, followed by auto parts suppliers) is raising the economic prospects in the Appalachian portion of the state.

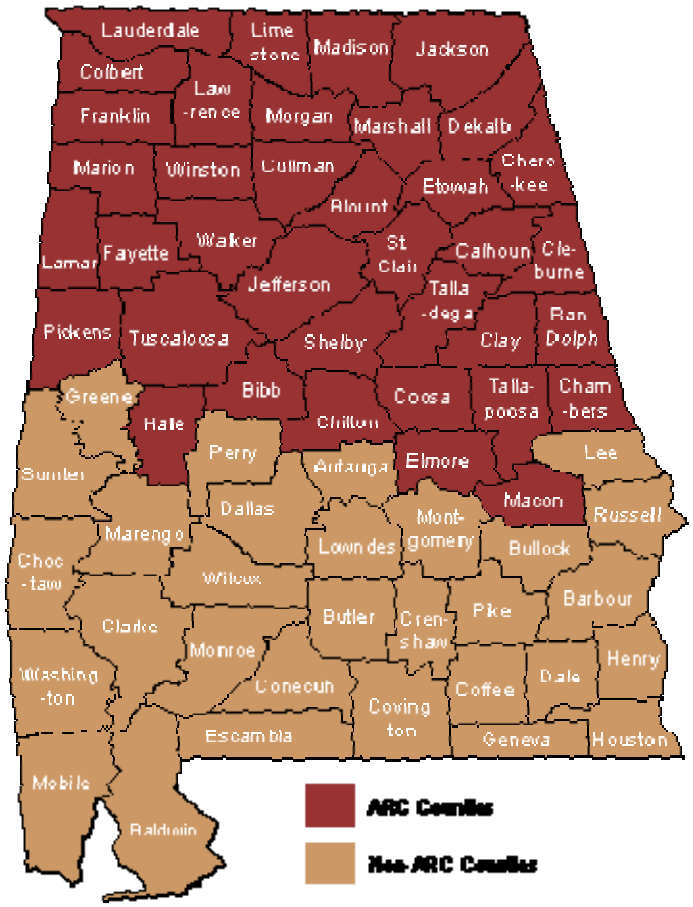
The Appalachian counties of Alabama have been at the center of a major industrial revival powered by foreign investments in the auto industry. The efforts Alabama made to attract Daimler Chrysler, Honda, Hyundai, and key suppliers resulted in the growth of an auto cluster that is now a well-known story. This case study examines the conditions that led to that success but also the extent to which the benefits reached the Appalachian non-metro parts of the state.

The strategy to attract the auto industry was an economic development, not a rural development strategy. Conditions in rural Appalachian Alabama, though not as dire as more southern areas or as other parts of Appalachia, nonetheless were poor compared to national standards. How did the auto cluster affect rural Alabama? Was there a spillover of investment and jobs into rural areas? Did it create new jobs and wealth or did it deplete non-metro counties by attracting the best and brightest to the higher paying jobs in the auto companies locating in metro Alabama? These issues motivated this case study.

7.2 Regional Profile

The Appalachian region covers the northern half of the state, as shown in Exhibit 7-1. Since this case study is vastly different from the other case studies in terms of its geographic size and level of diversity, the economic development context of the region is best understood by reviewing its historical evolution, and the predicament that it presented.

Exhibit 7-1. Northern Half of Alabama is within the Appalachian Region



This northern part of Alabama has a long industrial history that was built on the steel and related industries in and around Birmingham and, in the more rural counties, the traditional non-durable goods industries that migrated South during the middle third of the 20th century to take advantage of surplus labor, low costs, and right-to-work laws. The Appalachian counties of Alabama, in particular, benefited from the state's incentives, physical infrastructure, low wages, and federal investments.

During this period, manufacturing industry thrived in the rural areas. In 1984, the percent of employment in non-metro Alabama was 41.1 percent—and growing. The percent in metro counties was 18.5 and dropping. (source: Stuart Rosenfeld and Edward Bergman, *Making Connections: After the Factories Revisited*. Research Triangle Park: Southern Growth Policies Board, 1989). The share of metro workers employed in technical occupations, however was more than double the technical work force in non-metro counties. The biggest non-metro employers were furniture/wood (mainly in the northwest part of the state), metals, and apparel/textiles, rather than technology industries.

At the northernmost fringe of the state, in Madison County, Huntsville emerged as a high tech oasis. In the late 1940s, when Huntsville was still a small city in a non-metro county, the military brought German rocket scientist Werner Von Braun to the Redstone Arsenal. In1960 President Eisenhower dedicated the NASA-funded Marshall Space Fight Center there, and Huntsville became "Rocket City," one of the leading high tech centers in the nation.

The benefits of the space programs, however, did not reach out very far across the state, and in the early 1980s, Alabama began to realize that its still heavy reliance on low costs to recruit labor-intensive branch plants was increasingly precarious. Less developed countries could promise much lower costs with adequate skill levels and technological capacities.

7.3 Evolution of progress

In the1980s the University of Alabama, influenced by the work of the Southern Growth Policies Board and Southern Technology Center to connect universities and economic development, began looking for new investment. The northern area was home to the Southern Research Institute, University of Alabama, and a recognized high tech industry capability.

As part of the search for new and more stable industry, a university team and state officials together saw a window of opportunity in autos, a product for which growing domestic demand was likely to provide continued advantage and stability. The University of Alabama had prepared a strong proposal in the bidding to locate the Saturn plant in Tuscaloosa. Although GM ultimately chose the Nashville area, Huntsville came close enough that the die was cast to pursue the next big opportunity. That came in 1993, when Mercedes Benz announced it was looking for a U.S. location for a large new production facility, in large part to gain entry to the growing American SUV market, avoid currency fluctuations, and access new sources of knowledge.

Mercedes' needed a place in the United States that it could manufacture for both U.S. and export markets. To narrow down the options, the company established the following criteria:

1. labor force (underemployed but capable) and training system
2. physical infrastructure to make it easy to quickly reach suppliers and markets
3. supportive business climate (right-to-work, taxes)
4. existing and potential supplier base
5. strong university presence for access to business and engineering graduates plus adding to the area's "melting pot" environment
6. good quality of life, melting pot of auto cultures

Later, Honda's criteria would be quite similar, focusing first and foremost on the availability of a trained and trainable work force, logistics to accommodate movement of supplies and products, physical infrastructure, and opportunities for growth, and an accepting and cooperative community.

7.4 Catalysts of change

On all counts, Alabama was competitive. Its extensive road, rail, port, and air systems were essential parts of the infrastructure. Some suppliers were in place. The Appalachian region of Alabama was already home to a small part of the auto supply chain, including two General Motors suppliers in Tuscaloosa. Mercedes visited JVC during its decision-making process to see how the company operated in Alabama and observe any differences from what they were accustomed to in their German facilities.

Education and training, in particular, greatly enhanced the state's competitive position, but for different reasons. The most important, according to those involved in the process, was its customized training. The Alabama Industrial Development Training, which is funded through a direct state budget line item, was set up to deliver various levels of training plus a wide range of recruitment, filtering, and selection activities. The state's community and technical college system was not only already organized to prepare skilled technicians for many of the occupations critical to the auto industry through its Bevill Centers but also was a principal part of the state's manufacturing extension partnership (Alabama Technology Network). The primary impacts of the universities were the cultural and multi-cultural amenities and hospitable and open social environment they created in their respective regions.

The University of Alabama, with one of the first U.S. Department of Commerce-funded International Trade Centers, played a key role in convincing the German company to choose Alabama for its U.S. home. The universities also were sources of local expertise and problem solutions via their faculty and students in their science and engineering programs. The research capabilities of the universities have been more important to suppliers than the OEMs which continue to conduct most of their research near their home offices. The most valued contribution of the university, however, was the open and tolerant environment they instilled in their communities, particularly important to welcoming different cultures.

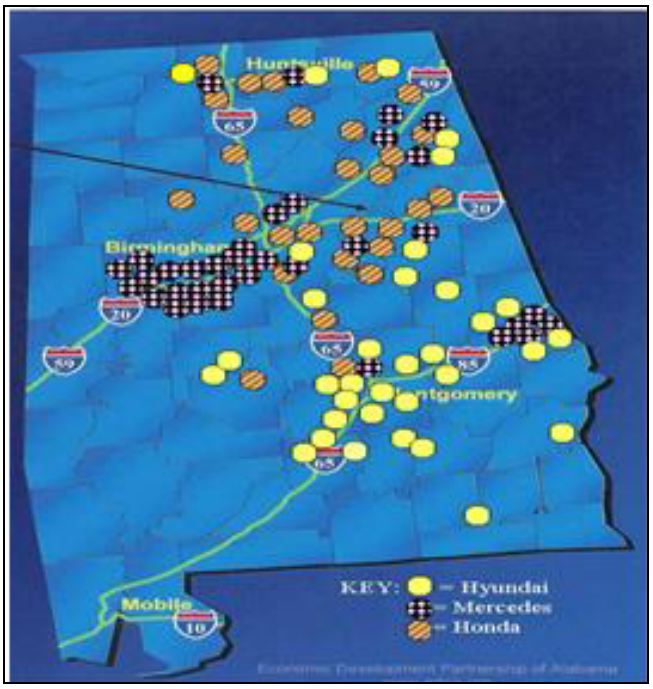
The elementary school system was undoubtedly the weakest link in the educational system. Although on average, Alabama is very close to the South's average, it has some of the most pressing rural education problems in the nation—ranked fifth most serious among all states(source: Jerry Johnson and Marty Strange, *Why Rural Matters 2005,* Rural School and Community Trust, 2005). But so long as a selection of good schools, public and private, were available to the employees and most employees were drawn from metro counties, overall statistics were not as barrier. It may, however, be one of the reasons that employment was so concentrated in urban areas.

The state further sweetened the pot—as did all the final candidates—with a sizable incentive package of $372 million, one of the largest given for new investment at that point in time.

Giving Birth to the Auto Supply Chain Cluster. The site selection team from Mercedes began with proposals from 30 states, reduced it to 12, then six, then three (North Carolina, South Carolina, and Alabama). In 1997 Mercedes announced its decision to build its plant in Tuscaloosa, Alabama. That decision put Alabama on the map of the U.S. auto industry, extending the automotive manufacturing corridor along Interstates 65 and 75 dubbed "Auto Alley" that ran from Detroit through Indiana, Ohio, Kentucky, and Tennessee into Appalachian Alabama.

With the rapid growth of auto industry in Alabama (and Nissan in Mississippi), the center of gravity of that dispersed supply chain has drifted farther and farther south. The choice of Tuscaloosa by Mercedes proved to be the birth of a full-blown regional supply chain cluster—that is, the state eventually developed the exporter-OEMs, a base of suppliers some of which are shared, specialized support, expertise, work force, education and training system, and social infrastructure that together comprise a cluster. The key was landing Mercedes. According to University Chancellor Malcolm Portera, "Had Alabama not landed Mercedes, there would be no auto assembly in Alabama." In 1998, the first year of production, Mercedes produced 68,800 units. (See map of the Alabama auto cluster in Exhibit 7-2.)

Exhibit 7-2. Alabama Auto Assembly and Parts Manufacturers



The incentives were important to the location decision but, according to site selection team members and economic developers, the value of incentives to the final decision was overrated and they were not the deciding factor. (Of course, only Daimler-Chrysler knows whether or not incentives were decisive and like all auto manufacturers, are unlikely to speak forthrightly about their importance.) They remain important, however, because virtually all U.S. regions offer them, and the absence of incentives could rule a location out of contention. State and business leaders offered different perspectives on the relative importance of the different reasons the two OEMs gave for their location decisions, but they all agreed that presence of a trainable labor force and state supported industry oriented education and training programs were the most important assets.

7.5 Lessons learned

The Human Capital Factor - Alabama is a good example of how an educational system can be focused to prepare for new job opportunities. The key to acquiring and growing the auto cluster was the presence of an underemployed but trainable labor force with the work ethic and learning potential the plants needed. The assembly plants had to hire large numbers of pre-qualified workers in a relatively short time since they did not intend to bring their work force with them. Mercedes officials initially were somewhat skeptical of the ability of Alabama to match the skills of Mercedes' German work force that was trained in its renowned "dual" vocational system (classroom theory combined with extensive work-based experience). By the time Honda arrived, however, it was clear that export-quality vehicles could be assembled in Alabama. A by-product of this workforce redirection towards in-state automotive assembly functions also meant that Alabama could be home to other vertically-linked businesses claiming a node position in several automotive supply-chains. These firms are then tied to auto-related business in Tennessee, Kentucky, Ohio, Michigan, Georgia, South Carolina and North Carolina.

Although Alabama as a state had lower levels of education than most states (in 1980 almost of third of adults living in non-metro counties had no more than eight years of education), attainment levels were higher in the Huntsville area and the state had a good record in vocational-technical education. Mercedes was concerned but believed the work ethic and training capabilities were on balance an advantage. They also realized that because their pay and benefits were going to be far above the state average, they would be able to attract the best from the incumbent work force. The companies that lost employees, then, would have to replenish their work force from the school systems. But this also meant that new job opportunities would eventually be dispersed across the region.

Alabama Industrial Development and Training (AIDT), according to multiple sources, was particularly important to both assemblers. Although customized training is now ubiquitous across the U.S., AIDT offers a fuller set of services than most competing

states, including advertising positions, taking applications, screening and then interviewing applicants, and conducting pre-employment training at plant sites, one of its permanent training centers, or in one of its 34 mobile units outfitted to meet a variety of technical training needs. The state's community and technical college system, which extended across the state, was an additional plus for Mercedes.

Mercedes initially brought over 150 Germans to conduct in-plant training and took workers to Germany for experience in German industry. But with the need to gear up and train a large workforce in a short time, the services and capabilities of Alabama's Industrial Development Training (AIDT) program quickly became a key to workforce recruitment, selection, and development.

The role of the university system is less clear cut. According to one state leader, it was "the spark that caused the automobile manufacturing fire" in the state. In this view, Alabama's engineering programs would provide the stream of engineers, student interns, and faculty consultants required to produce high-quality automobiles in a state with little experience in automotive manufacturing. Some graduating engineering did enter the industry but in general in the upper tiers of the auto industry, searches for engineers and top level managers tend to be national to attract the most experienced people possible. At the same time, engineering graduates from Alabama universities look nationally for employment—the majority of the state's engineering graduates leave Alabama to find jobs. The role of engineering students and programs, however, is clearer. Many students enter into coops with the industry and/or design engineering projects in cooperation with the industry. The presence of the schools offers opportunities for employees to get more advanced degrees or just upgrade their skills.

In the supply sector, there is little demand for engineering skills, as design and engineering are generally performed at existing sites in places like Michigan, Ohio, Germany, and Japan, rather than at new branch plants. There has been some movement into engineering functions at the 4th tier in Alabama and some prospects for further involvement. Overall, though, it might be the case, as one local official suggested, that the auto industry might rely more on University of Alabama's business school than on its engineering school.

Building blocks of human resource development **-** The state's formal education system starts with pre-school and continues through post-graduate education. But a comprehensive human resource development system also includes a variety of vendor-, industry- and company-based education and training, continuing and management education and informal learning. In Alabama, the public sector plays a major role at all levels.

1. ***Alabama Industrial Development Training***, created in 1971 by the state legislature to support economic development, was a major resource for the auto cluster. Administered by the Department of Postsecondary Education, AIDT's highly placed advisory council from business, industry, and education guide and advise its work. In 2004, the governor and Mercedes jointly announced a new

"backfill" program called Focused Industry Training at 34 sites to help fill the positions left open by those hired by the auto industry. Sites are located in and around the three assembly sites. A 400-hour curriculum produced an Alabama Certified Worker credential recognized by many of the state employers. To underline its importance to Alabama, AIDT has a line item in the state's budget.

2. ***The University of Alabama*** was instrumental in focusing the state's resources on the auto industry and in developing the proposals for both Mercedes and Honda. Its engineering and business schools and its International Trade Center were key factors, but it also created a welcoming environment for foreign investment. It runs, for example, a German Saturday school on campus that teaches math, science, and German language. It helped orchestrate the "Commission on Community Change" to help improve the quality of life in the area. The Alabama Productivity Center at UA was available to work on production problems with companies and the Center for Advanced Vehicle Technologies was established in 1998, the year Mercedes began production, with funding from the U.S. Department of Transportation.

3. ***Alabama's community college system*** was also an important factor. In the final competition, North Carolina's governor even offered as part of its package of incentives to build a "Mercedes University" within its already strong community college system. Alabama's approach, however, was to offer to target the resources of its existing system. Bessemer Technical College (now merged with Lawson State Community College) and Shelton State Community Colleges both offered relevant education and training. The well-equipped Bevill Center for Advanced Manufacturing at Gadsden State Community College offered a nationally known and respected education and training programs in precision manufacturing and they housed a key part of Alabama's manufacturing extension service. That Center was the result of a historic partnership between the college, the University of Alabama, and the city of Gadsden growing out of successful efforts there to save a GM plant in the early 1980s. (source: Stuart Rosenfeld, *New Technologies and New Skills: Two- Year Colleges at the Vanguard of Modernization,* American Association of Community Colleges, 1995).

   The auto industry relies on the community college system for its more advanced training and to improve employees' opportunities for advancement. Honda encourages (and reimburses) its associates to work towards Associate Degrees at the community colleges. To accommodate Honda's policy of rotating its work force among shifts, the college system has arranged programs in which faculty alternate their class hours between day and evening consistent with the shift changes.

4. ***The state's public school system*** was probably the weakest link in Alabama's human resource development chain. While improving, it remains low compared to most other states, and was given a "D" by the Corporation for Enterprise development in its 2005 scorecard. Alabama ranks in the bottom ten states in

reading and math proficiency of 4th and 8th graders. One place the state has improved is in reducing the disparities among races and between genders, although disparities according to income were second highest in the nation. Graduation rates, while climbing, are still among the lowest in the nation. This is a particular issue for non-metro counties that, according to the Rural School and Community Trust. Alabama has the fifth most critical rural educational needs in the nation based on availability and distribution of educational funds, special needs, and poverty rates. (source: Jerry Johnson, Marty Strange. 2005. *Why Rural Matters: The Facts about Rural Education in the 50 States*. Rural School and Community Trust .)

The Topography Factor – also conducive to the entrenchment of automotive assembly activities in Alabama has been the availability of readily developable, affordable land amidst situated within an ample highway network.

7.6 Interviewees

Gregg Bennett, Alabama Technology Network and The Bevill Center for Advanced Manufacturing

Ernie Cowart, Senior Economic Development Specialist, Economic Development Partnership of Alabama

Robert Culver, Top Alabama Regional Council of Governments

Austin Dare, Mercedes-Benz

Brad Davis, Director, Alabama Technology Network

Steven Dean, Randolph County Chamber of Commerce

Dale Greer, Cullman Economic Development

Lee Hammett, Automotive Group Manager, AIDT

James Hayes, President, Economic Development Partnership of Alabama

Greg Knighton, Director of Business Information, Economic Development Partnership of Alabama

Jeff Newman, University of Alabama

Linda Paulmeno, Mercedes-Benz

Ray Perez, Honda Corporation

Malcolm Portera, Chancellor, University of Alabama

Bernard Schroer, Alabama Automotive Manufacturers Association

Steve Sewell, Executive Vice President, Economic Development Partnership of Alabama

Dana Stone, Program Manager, Alabama Technology Network

Perry Ward, President, Lawson State Community College

8.0 Conclusions – Strength of Growth Processes

The preceding six locations examined through case study exhibit distinct bases upon which their regional economies are organized, and varying degrees of success in achieving growth. Why do some of these studies show more pronounced evidence of a growth path than others? For locations with improving economic results can we attribute this to a growth orientation that's just right for the local conditions regardless of whether the evolution was organic or achieved by planning intervention? Or even if regional planners and local stakeholders diligently frame a growth path and strategy are they guaranteed success? What role does geography play in determining the strength of growing trade center, or a tourism market for example?

We summarize the highlights as follows:

Growth Affirming Case Studies

Case Study	***Chautauqua, NY***
Growth Process	***Tourism Development***
What worked *Working to organize, market and leverage tourism assets into a year-round offering *Diversify the county's economy to reduce the exposure to shrinking manufacturing presence ***What Else worked*** *Reinforced a vital segment of its Trans Equip MFG base & facilitated its expansion creating higher value-added/paying jobs and advancing the skills of the workforce. The latter with the help of the county's Workforce Investment Board and the community college's Manufacturing Training Institute *Selective retention of this firm and other manufacturing likely not possible without ADHS corridor "T " which offers a viable connection to I-79 and I-90.	

Growth Affirming Case Studies

Case Study	***Alabama's Manufacturing Resurgence***
Growth Process	***Automotive Assembly***
What worked	
*Incentives alone were not expected to be the silver bullet	
*State's Educational system (k-12, Community Colleges and advanced degree conferring institutions) has been a proactive and responsive element to assuring the workforce needs of all aspects of the vertical-chain of firms	
*Leadership from both state and regional agencies persevered to succeed in the germinal event - attracting Mercedes-Benz to Tuscaloosa	
What Else worked	
*Workforce programs assisted in retraining textile workers from jobs going overseas to automotive applications growing in state.	
* Ample land resources (typically flat green fields) with relatively unencumbered permitting process	
*Good highway accessibility to parcels developed	

Growth Affirming Case Studies

Case Study	***Corridor K Region***
Growth Process	***Tourism Development***
What worked	
*Regional collaboration (e.g. *SEIDA*) between SE TN and SW NC to further develop eco-recreational-cultural tourism assets	
*Addressing the road access capacity to carry regional visitors	
*Water resource planning to support rafting tourism	
What Else Needs to Happen	
*Establish a direct connection between the terminating corridor cities of Chattanooga and Asheville that will separate through traffic from tourism trips to corridor communities	
*Ensure that cities such as Murphy (Cherokee Co., NC) that desire to retain a healthy industrial component obtain efficient highway links to I-85, and I-65.	

Growth Affirming Case Studies

Case Study	***Morgantown-Fairmont***
Growth Process	***Hi-Tech Spin-offs from Educational Assets***
What worked	
*I-79 backbone through the Morgantown MSA has facilitated regional collaboration, most predominantly between Morgantown and Fairmont.	
*Infusion of federal research grants secured by U.S. Congressional representative & research readiness	
*City of Morgantown provides good entrepreneurial support	
*Ample higher education assets: WVU (Morgantown), Fairmont State University & Fairmont State Community Technical College	
*Technology-transfer office of WVU and WV High Tech Consortium in Fairmont	
Fairmont's smaller hi-tech economy appears to serve as a complement to Morgantown's economy	
What Else Works	
*I-68 connection (ADHS corridor E) links Morgantown to Baltimore-Washington area	
What Else needs to Happen	
*Fairmont needs to find opportunities to commercialize federal support research and incubate local start-up firms	
*Region needs additional east-west access without which the current limited extent of beneficial urban spillovers intraregionally goes unchanged	

Growth Ambiguous Case Studies

Case Study	***Scioto County Ohio***
Growth Process	***Alleged Trade Center***
What Happened	
Extra-regional N-S and E-W highways bypassed the county	
Difficult transition since 1980 as key manufacturing sectors (e.g. Steel, Shoes) moved jobs overseas	
Lack of critical mass in services to effectively draw surrounding rural consumers (household or business)	
Adverse urban backwash effect on Scioto as surrounding rural counties gained access to extra-regional metro area markets in Columbus, Cincinnati and Huntington WV.	
Geographic constraints of hilly terrain and flood plains of the Scioto and Ohio rivers limit developable land	
What Else needs to Happen	
Develop cultural and shopping amenities	
Remedy recruitment problem for doctors to the So. OH medical Center	
Launch high-tech health care services for hospital to serve a broad regional market in a realistic niche	
Build on the regional collaboration success of SODI in securing a new manufacturing resurgence in Scioto using joint infrastructure financing, brownfield redevelopment	
Build from/retrain the remnants of Scioto's strong manufacturing workforce	

Growth Ambiguous Case Studies

Case Study	***Pike Co., KY and Big Sandy Area***
Growth Process	***Diversifying from Extraction Industry reliance***
What Happened	
*Unique cut-through project completed in 1987 provided Pike Co. new developable land and better access	
*County as recipient of Coal Severance Tax to fund community development projects	
*Though still an economy based on coal mining, Pike Co. has taken on a function as a regional economic hub for other counties in the BSA	
*Emergence in healthcare services the result of cooperative efforts between Pikeville Medical College & Pikeville Medical Development Corporation (PMDC)	
*PMDC also champions non-healthcare economic development opportunities for the county	
*Pike Co. has good highway access, offers rail freight service and a regional airport	
What Else needs to Happen	
*Furthering industry diversification will require retraining of former mining workforce given population losses	
*More multi-county planning initiatives to remedy the paucity of positive economic spillover from Pike Co. to the four other BSA counties which remained *distressed*	
*Investment in regional amenities to retain/attract working age population	

These examples each show that numerous interventions or aspects contribute to the economic situation counties find themselves with. Whether economic progress or stagnation is the situation, these processes take time. This is both double-edged. First, there is no quick turn-around strategy. Well conceived program investments and targeted policy must be committed to with patience and a willingness to reassess over time and readjust as the background regional or macroeconomic conditions change. Second, there is always a time to take action towards improving the economic prospects of communities that have been in persistent distress. Some of these communities have high hurdles to ever developing a modest sized employment centers for their working age residents. This does not however preclude ensuring that

populations gain access to regional employment opportunities – so that expanding healthcare services growth in Pike County may spell more of an opportunity for workers from Floyd, Martin, Magofinn and Johnson counties as well.

Likewise Scioto County, a distressed micropolitan area, along with six other distressed Appalachian counties in the local development district need to build more regional solutions that can leverage the economic success at the periphery of the district and Appalachian boundary (in Brown, Clermont, Highland & Ross counties) to help revitalize the core of the region.

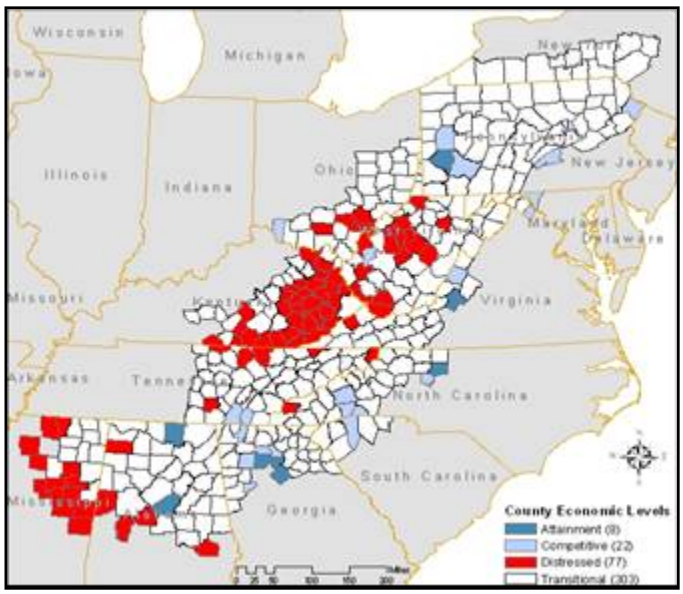
Many of the barriers or challenges to growth can be named: *topographical* (land constraints or access barriers), *underserved by necessary transportation infrastructure, limited local market demand, limited local services, limited labor supply and quality from persistent out migration and limited educational-training resources, neighboring economies that compete or fail to synergize regional opportunity, adverse urban/core backwash effects*.

Last, the case studies demonstrate that several key aspects must improve in sync to welcome economic development. All growth paths require good transport access and a suitably trained workforce for the employment center they will access. Other important components depending on the growth strategy are attracting federal research dollars to advance the role of higher-education institutions that are present, and learning to commercialize research and spur small business starts; evolving recreation and cultural assets into a tourism product with critical mass and learning to market the product; and improving both housing stock and local amenities as a mean to retain and attract working age population.

In the next volume of findings for the study of Sources of Growth in non-metro Appalachia, we interpret several statistical tests of the possible spatial influences at work in the economic outcomes of Appalachian counties.

Sources of Regional Growth in Non-Metro Appalachia

Vol. 3 Statistical Studies of Spatial Economic Relationships



Prepared for the Appalachian Regional Commission

Prepared by:

Economic Development Research Group, Inc.

MIT Dept. of Urban Studies & Planning

Revised 2007

SOURCES OF GROWTH PROJECT

The *Sources of Growth* project is part of a series of research efforts funded by the Appalachian Regional Commission to improve our understanding of factors affecting economic growth in rural and distressed areas. As stated in the Volume 1 Introduction, "the starting premise of this project is that there can multiple paths that an area can pursue in successfully enhancing job and income creation. They may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. The resulting direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development." This research is intended to provide a basis of information that can ultimately be useful for enhancing the effectiveness of policies and tools aimed at improving the region's economic development.

This is Volume 3 in a series of reports prepared as part of this project:

- ***Executive Summary*** –synthesis of findings from all work products related to the study's four main research components.

- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties, classification of economic development growth paths, and a synopsis of white paper findings on theory relating to economic development growth paths.

- ***Volume 2, Case Studies of Local Economic Development Growth Processes*** – findings related to growth paths as observed for selected case studies covering manufacturing industry specialization clusters, supply chain-based development, tourism-based development, advanced technology development, and diversification from resource-based economies.

- ***Volume 3, Statistical Studies of Spatial Economic Relationships*** – findings from a series of econometric modeling and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.

- ***Volume 4, Tools for Economic Development & Study Conclusions***– description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** – (A) Spatial Analysis of Economic Health, (B) Economic Analysis of Hub-Spoke Relationships, (C) White Papers on Economic Growth Theories, (D) Literature Review of Empirical Studies on Spatial Influences in Economic Development.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This volume was authored by staff of Economic Development Research Group, Inc. and by faculty and graduate students of the Dept. of Urban Studies & Planning at the Massachusetts Institute of Technology. Other volumes in this series were also co-authored by staff of Regional Technology Strategies, Inc.

The Sources of Growth project involved a team of researchers including:

- Economic Development Research Group, Inc. (EDRG) – Lisa Petraglia (Project Director), Glen Weisbrod and Teresa Lynch, with research support from Tyler Comings, Brett Piercy and Susan Moses;

- Regional Technology Strategies, Inc. (RTS) –Stuart Rosenfeld, Phil Psilos and Dan Broun;

- Massachusetts Institute of Technology, Department of Urban Studies & Planning (MIT-DUSP) – Prof. Karen R. Polenske, Prof. Joseph Ferreira, Jr., Ayman Ismail, and Li Xin, with research support from Tan Zhijun, and Isabelle Yi Xu.

The project also benefited from the expertise of outside policy and research experts who reviewed documents, participated in project meetings and provided technical guidance: Deb Markley (Co-Director of the Center for Rural Entrepreneurship, a Rural Policy Research Institute), Joseph Cortwright (Vice-President of Impresa Consulting), Ken Poole (Executive Director of ACCRA: The Council for Community and Economic Research), David Freshwater (Professor of Agricultural Economics and Public Policy at the University of Kentucky), David McGranahan and Luc Anselin (Professor, Dept. of Agriculture & Consumer Affairs and Regional Economics Applications Laboratory at the University of Illinois, Urbana-Champaign).

Overall project direction and oversight was provided by Dr. Greg Bischak of the Appalachian Regional Commission, whose wide range of research experience served to focus the project team on the development of policy applications. Important insight and suggestions were also provided by officials of the Appalachian Regional Commission who participated in a day-long symposium with the project team, including Thomas Hunter (executive director of ARC, Ann Pope (federal co-chair of ARC) and Rick Peltz (alternate federal co-chair). In addition, Ken Wester and Jason Wang of ARC assisted the project team in collecting and assembling transportation and geographic data.

Finally, the project team acknowledges the important role of prior ARC-funded research studies by Andrew Isserman, Ed Feser and Oleg Smirnov that provided a foundation for this project to build upon.

1 INTRODUCTION

1.1 Background

Role in the Sources of Growth Project. Volume #3 presents results of four empirical research studies conducted as part of the Sources of Growth project. These studies build directly on the discussion of theory and prior research which are covered in Volume 1, and corroborate some of the case study findings of Volume 2.

The prior documents identified a consistent set of location and access factors that affect the economic viability and opportunity of various growth paths. They are summarized in Exhibit 1-1. Accordingly, all four of the empirical research studies presented here examine an aspect of the relationship between a county's spatial location or access characteristics and its pattern of economic growth and development. All four also utilize some form of econometric modeling and/or geographic information system to examine these relationships.

Exhibit 1-1. Location and Access Factors Affecting Economic Growth Paths

Basis for County's Economy Growth	Examples of Location and Access Factors
Trade Center	• Adjacency of rural markets (spokes) to micropolitan trade centers (hubs); • Scale of markets relative to regional population
Agglomeration (*e.g.* cluster economy)	• Labor force size • Delivery market reach
Supply-Chain (*e.g.* dispersal economy)	• Distance to highway, rail terminal, air or marine port • Same day delivery distance
Natural Amenity or Cultural Assets	• Access to visitor markets • Distance to highway
Knowledge (Learning) Assets	• Labor force or population size • Proximity to major education or technology institutions

The motivation for this research comes from three directions: (1) recognition that while the various paths of economic growth serve different markets, they all depend in some way on access; (2) the fact that many of ARC's programs aim to reduce isolation and improve access, and (3) the availability of relatively new analytic methods for

examining spatial relationships among counties. This research thus aims to build upon prior ARC-funded research and to advance our understanding of how ARC investments promote economic development by reducing isolation and increasing local capacity for growth.

1.2 Study Summaries and their Foundations

Extending Prior Research. It is important to note how these research efforts build upon prior studies.

- The first study focuses on enhancing our understanding of relationships between counties that serve as rural trade centers (economic hubs) and adjacent counties that are served by them (economic spokes). This work by Ayman Ismail of MIT utilizes new economic base techniques first explored by Smirnov and Smirnova (See ""An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia," 2000) and revisits the evaluation of county-level "spatial regional multipliers" based on more recent employment data.

  The Pike County case study of Volume 2 can be better understood from the perspective of how well its economy ties into those of the four other counties in the Big Sandy Area (BSA) – all distressed counties. Pike County's transitional status has been achieved through attempts to gradually diversify its mining economy, and through a unique public works project that removed barriers to development, and opened access options. The BSA counties of Maggofin and Martin exhibit the weakest *spatial regional multipliers* of the five counties, and all five counties have economic compositions that tend to hinder each in benefiting from growth stimulated in a neighboring economy (low *total spatial linkage multiplier* values).

  The Morgantown-Fairmont case study on the other hand now can be further understood as each county (Monongalia and Marion) having strong internal economic linkages (high *spatial regional multipliers*), and room for their economies to become more reinforcing if mutually desired (low values for their *total spatial multiplier* as of 2002 and four of the top 5 employing sectors are in common). Monongalia County's metro status explains in large part why this county has a *local spatial linkage* multiplier that is more than double that of Marion County.

  We can also understand that the Corridor K case study county of Cherokee, NC though transitional, exhibits as strong an internal employment multiplier and local spatial linkage multiplier as the corridor's terminating metro counties which have competitive economic status. This result for Cherokee County can be attributed to the trade center role exerted by the City of Murphy on

surrounding counties in NC, GA and TN.

- The second study focuses on enhancing our understanding of relationships between highways, ARC investments and subsequent economic growth over a long period of time. This work by Teresa Lynch of EDR Group utilizes time series regression techniques. It updates and extends a direction of research using "twin counties" that was initially developed by Andrew Isserman (see "The Economic Effects of the Appalachian Regional Commission", by Isserman and Rephann, 1995.) An improved specification for ADHS highway capacity and access was tested and found to significantly contribute to the differential income and earnings growth experienced from 1969 to 2000 for ARC counties relative to their twins' performance.

  The Scioto County case study in Volume 2 revealed that Scioto has been bypassed by recent highway investments while the ring of neighboring counties have benefited through improved highway access to the metro areas of Cincinnati, Columbus. These extra regional economies exert an adverse urban backwash effect on Scioto County that challenges any geographic predilection for it to serve as a thriving trade center.

  Likewise the partial explanation of positive differential growth outcomes for Appalachian counties from highway access improvements is a welcome expectation for the counties in SE Tennessee and SW North Carolina aligned along Corridor K. Whether improved economic outcomes result from better market reach of the region's eco-tourism and cultural heritage assets and/or eventual economic integration into the metro Appalachian counties that terminate the corridor (Hamilton Co., TN and Buncombe Co., NC) it will not occur without better access through the region.

- The third study focuses on enhancing our understanding of the relationship of business mix to (a) the size of the local population base and to (b) accessing quality air services. The analysis of market scale shows how trade centers differ in industry composition depending on market size. The analysis of airport access shows how highway drive times to airports also affect industry mix. This work by Teresa Lynch, Glen Weisbrod and Tyler Comings of EDR Group uses non-linear regression techniques and geographic information systems. It builds upon the prior ARC report, "Handbook for Assessing Economic Opportunities from Appalachian Development Highways" by Weisbrod et al., 2001.)

- The fourth study focuses on use of new advances in geographic and spatial analysis techniques to illustrate how proximity to mountains and roads affects economic development patterns and trends among counties. This work by Prof. Joseph Ferreira, Jr., Ayman Ismail, and Li Xin shows the use of GeoDa software for spatial analysis. It represents a pilot effort to demonstrate the value of spatial analysis to better understand factors affecting the economic

development of Appalachian counties.

The case studies from Volume 2 that in part have some aspect of economic performance tied to physical terrain (as constraint or not) include Pike County KY and its neighbors in the Big Sandy Area, Scioto County OH embraced by two rivers, Corridor K's Cherokee County NC as trade center to a group of counties surrounded by a mountain ring, and for the case of Alabama an abundance of relatively flat land with broad highway coverage.

2 ECONOMIC BASE MODELING OF HUB AND SPOKE GROWTH PATTERNS

"Economic Base Modeling to Test Growth Patterns"
by
Ayman Ismail,
Massachusetts Institute of Technology

2.1 Introduction

This chapter presents an update of an economic base analysis of Appalachia's *distressed* and transitional (380 counties combined) counties using economic base theory which has been augmented to address possible spatial influences on a county's economic strength. This analysis was first conducted for the ARC (2000) by Smirnov-Smirnova to test whether distinct spatial growth patterns have a role to play in the performance of Appalachia's distressed, and near-distressed Transitional (153 counties at the time of the original analysis). The original study monitored employment growth performance (based on the strength of the regional employment multiplier) from 1992 through 1996. This update focuses on the period 1997 through 2002.

Summary of Original Research. In their "Assessment of the Economic-Bases of Distressed and Near-Distressed Counties in Appalachia," presented to the Appalachian Regional Commission (ARC) in 2000, Smirnov and Smirnova (hereafter referred to as S&S) use economic-base and location-quotient techniques to provide a detailed assessment and typology of 111 distressed and 42 near-distressed[1] counties in the Appalachian region in 1992 and 1996. The authors perform three key analyses to understand and assess the counties under study. First, they analyze the economic-base of distressed counties to identify their strengths and weaknesses and their potential for economic growth. The economic-base is defined as the collection of establishments in which the county specializes, where a county's employment in that industry is greater than the average for the rest of the country (i.e., it has an employment location-quotient greater than one).[2] Second, they identify the industrial-mix of economic-

[1] The ARC has since changed the terminology for the subset of transitional counties previously identified as *near-distressed* to *at-risk.*
[2] We will sometimes refer to the *economic-base* of a region as the *export-base*.

bases and regional spatial effects as important factors in shaping the regional economies of distressed and near-distressed counties. Third, they establish a typology for key parameters that characterize the economic potential of the economic-bases of distressed and near-distressed counties using regional employment multipliers and strength of spatial linkages; the latter measured by a spatial multiplier.

Based on their empirical analysis, S&S, identify several relationships and patterns that affect the economic development status in Appalachian counties:

- Within select types of economic-bases and specific classes of economic distress a strong relationship exists between the key parameters, such as population, employment, average wages, and per capita income of distressed and transitional counties. The S&S comparison of economic-bases between the distressed and near-distressed counties against the more prosperous economies in Appalachia reveals significant disparities in their key parameters.

- Regional employment multipliers show a direct (positive) relationship between the level of economic distress and the strength of the economic-base. In 1996, the average regional multiplier for distressed and near-distressed counties was 1.79, which is 11 percent lower than the average regional multiplier of 1.99 for all Appalachian counties. Distressed counties with higher values of regional multipliers tend to perform better and have higher economic growth potential than those with lower multiplier values.

- The industrial mix of the economic-bases of distressed and near-distressed counties is dominated by resource-oriented, technologically disadvantaged industries, many of which pay relatively low wages, have a low potential for growth of employment, and have little positive effect on local demand. The traditional components of Appalachia's industrial-mix are resource-oriented/extraction industries, such as coal-mining and agricultural production, where steady declines caused economic distress in affected counties. More dynamic and technologically advanced industries are virtually non-existent in the distressed areas of Appalachia.

- Spatial effects play an important role in shaping the economic-bases of all economies. The magnitude, direction, and scope of spatial effects for distressed and near-distressed counties differ from those of other counties in Appalachia. Distressed and near-distressed counties have very weak local and global economic linkages that lead to their limited economic opportunities and slow growth rates.

- The gap between distressed and prosperous counties in Appalachia is widening. On average, socio-economic parameters, such as population, employment, average wages, and per capita income of distressed and near-distressed counties, are growing at a substantially slower rate than they are in the rest of Appalachia. S&S identify four key characteristics as defining patterns of persistent self-reinforcing

economic distress: *(1)* small size of rural economies, *(2)* non-diversified economic-bases, *(3)* stagnant industrial mixes, and *(4)* weak spatial linkages.

Based on these patterns, S&S find that the economic growth potential differs among distressed and near-distressed counties. There are a total of 13 distressed and near-distressed counties (termed Type I) that have well-diversified economic-bases, strong spatial linkages, and their economic-growth potential is as strong as that of prosperous counties in Appalachia. The majority of these counties are perceived as potential hubs—regions that are capable of propagating economic growth in the neighboring regions. Also, 21 counties (termed Type II) are approaching a similar level of potential for economic growth. An important distinction is that these counties form 'tight spatial clusters'. These counties are likely to overcome economic distress and achieve a pattern of self-sustainable economic growth, however, their economic development initiatives have to be coordinated at the multi-county level. In total these 34 counties, with somewhat diversified economic-bases and some economic-growth potential, form spatial clusters, which highlights the need for policies and initiatives that promote closer economic ties between neighboring counties. Exhibits 2-1 and 2-2 identify the counties whose economies have been portrayed as functioning as a regional hub or regional spokes.

Exhibit 2-1. Potential Regional "Hubs" from among Select Appalachian Counties, Smirnov (2000)

Distressed and Near-Distressed Counties with Growth Potential as Regional Hubs (13 counties) – Type I	
Spatial linkages are strong, economic base is strong and well-diversified, the type of economic base is either service-based or non-specialized	
Distressed Counties	**Near-Distressed**
Scioto, OH *Fayette, PA Raleigh, WV Randolph, WV	*Talladega, AL *Allegany, MD *Belmont, OH *Guernsey, OH *Jefferson, OH Cumberland, TN Tazwell, VA Greenbrier, WV Marion, WV
* Counties with both strong exports and local inter-county spatial links; other counties are those with only strong, local inter-county spatial link.	

Exhibit 2-2. Potential Regional "Spoke" Economies from among Select Appalachian Counties, Smirnov (2000)

Distressed and Near-Distressed Counties with Potential Influence on Neighboring Counties (21) – Type II	
Spatial linkages are relatively strong, economic base is relatively strong and relatively well-diversified	
Distressed Counties	**Near-Distressed**
Bell, KY Breathitt, KY Floyd, KY Harlan, KY Johnson, KY Knox, KY Perry, KY Pike, KY Rowan, KY *Whitely, KY Alcorn, MS Monroe, MS Oktibbeha, MS *Athens, OH *Gallia, OH Wise, VA *Logan, WV Upshur, WV	Jackson, KY Greene, TN McMinn, TN
* Counties with both strong exports and local inter-county spatial links; other counties are those with only strong, local inter-county spatial link.	

Complementary industrial and labor market linkages among closely located counties, or clusters of counties, have substantial beneficial effects for all counties involved, enhancing competitiveness of local products and services, and creating a base for successful multi-county industrial clusters. Poor choice of the industrial mix to be promoted in one county might undermine economic opportunities in the neighboring counties.

Update from the Spatially-augmented Export-base Analysis. The original analysis was updated for the Sources of Growth study using a more current set of data (years 1997, 2002) sourced from IMPLAN[3] and provided specifically for this task by the ARC. The analysis methodology is reviewed in the next section before presenting the findings for the 1997-2002 period. Additional information is provided in a separate Appendix document.

[3] IMPLAN ® is an economic-impact modeling system provided by the Minnesota IMPLAN Group, Inc. Industry-level data are developed primarily from County Business Pattern data and select REIS data totals

2.2 Export-base Analysis Methodology

S&S derive a spatial export-base model by applying the principle of demand-driven modeling to the two-level hierarchy of regional economy emanating from the county level (the first being the county itself, and the second being the county and its neighbors). This results in a three-sector economy with one non-basic sector and two basic sectors (serving local and global exports). They use a county's employment in export-designated industries relative to the entire United States as an indicator of its economic-base; and location-quotients to identify a county's export employment in an industry against the rest of the United States. Based on this model, they perform four key analyses:

- Strength of economic-base using regional employment multipliers
- Strength of spatial linkages
- Degree of diversification in the economy
- Classification of counties by growth potential

Strength of the Economic-base. S&S use a concept of Regional Employment Multipliers (REM) to measure the strength of the economic-base. REM is defined as the number of new jobs generated in the county's economy as a result of an additional job in the export-base sector. Higher REM values correspond to a stronger economic-base.

The classical export-base model establishes that the total employment in the county (X) is the sum of export-base employment (E) and non-base employment (L):

$$X = L + E \qquad (1)$$

The critical assumption of the export-base model is that employment in the local sector is related only to the total employment in the county:

$$L = aX \qquad (2)$$

Where (a) is the requirement coefficient, which denotes the demand for local services by the regional economy, and $0 < a < 1$.

Combining (1) and (2), we obtain:

$$X = \frac{1}{1-a} E \qquad (3)$$

where the $\frac{1}{1-a}$ coefficient is the **Regional Employment Multiplier (REM)**, which

indicates how change in the export-base employment affects the regional economy, i.e., every additional job in the export-base sector creates a total of X jobs in the regional economy.

The standard export-base model analysis approach does not include spatial elements in the parameters of the model, *e.g.*, county location or socioeconomic environment. These assumptions limit the application of the model to the analysis of large geographical areas, such as states.

Strength of Spatial Linkages. S&S modified the export-base model to include spatial linkages to the neighboring counties and the rest of the world, based on a two-region model (Exhibit 2-3). The first region is represented by a county (County A). The second region is represented by the *expanded region of neighboring counties*, which comprises the county and its direct neighborhood of adjacent counties. The export base model for that region is similar to the single county case:

$$X^R = L^R + E^R \quad (4)$$

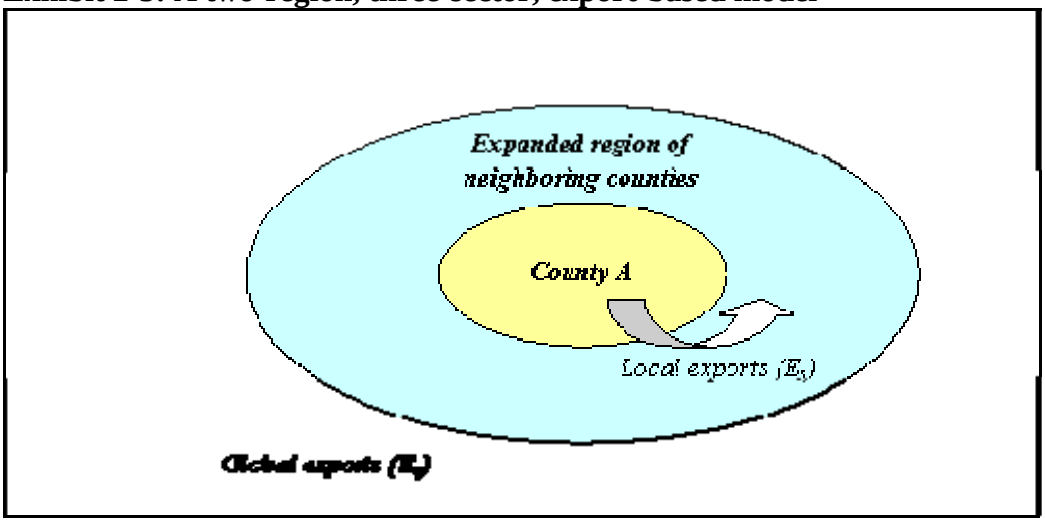
$$L^R = cX^R \quad (5)$$

Total employment in the context of this expanded region is related to the employment in the basic sector via the multiplier effect:

$$X^R = \frac{1}{1-c} E^R \quad (6)$$

The spatial export-base model implies no cross hauling within the aggregate multi-county region; i.e. a sector's product exported to the neighboring counties is not subsequently exported.

Exhibit 2-3: A two-region, three-sector, export-based model



Source: MIT Multiregional Planning Research Group.

This spatial export-base model links two levels of the regional hierarchy: (1) the

county model, and (2) the expanded region of neighboring counties model. Exports from a county comprise two components: local exports E_s (exports to the expanded region of neighboring counties) and global exports E_g (exports beyond the county and its neighborhood).

$$X = L + E_s + E_g \qquad (7)$$

where (X) is the sum of the export-base employment ($E = E_s + E_g$) and non-base employment (L); (E_s) is the portion of the export-base employment attributed to exports to the neighboring counties, and (E_g) is the portion of the export-base attributed to global exports (exports beyond neighboring counties).

This spatial export-based model leads to a three-sector economy, with a county's economy consisting of three sectors, one local non-basic sector and two basic sectors. We maintain the assumption of the classical export-based model that the employment in the local sector is related only to the total employment in the county:

$$L = aX \qquad (8)$$

County A's first basic sector is the sector that provides goods and services to the second basic sector in the expanded region. Assuming a linear relationship, we determine employment in this basic sector by:

$$E_s = bE^R = b(E_g + E_g^l)\,. \qquad (9)$$

where (E_g^l) is the size of the global export-base in the neighboring regions (counties), coefficient *b* (where $0 < b < 1$)[4] is a coefficient that indicates the requirement for employment tied to local export activities in the county and its spatial neighborhood.

The second basic sector is associated with goods and services supplied outside the expanded region. This assumption is a logical extension of the classical export-base model, which aims to explain employment in all sectors of the regional economy via

[4] The technical and economic bounds on the values of the coefficients: The bounds on the value of coefficient b are determined from practical considerations of model use. The lower bound b = 0 implies that all county exports are global, i.e. industrial mix of the county is identical to the industrial mix of the aggregated region. The upper bound, b = 1, still does not imply that all exports are local. However, high values of the coefficient b >=1 would have implied a "super-efficient" job-creation by global exports: one job created in the global export would have made a direct impact of equal or larger magnitude on the local exports. While technically this situation is possible, it simply suggests that the global export industry is a pass-through industry, which is instrumental, but not the reason, for the global exports. For example, if local export is generated by manufacturing in county A, and global exports is a shipping company in the neighborhood of county A, then the co-location of the two industries is driven by the demand on the manufacturing goods. High values of the coefficient b contradict the major economic assumption of the export-base model, which postulates the demand-driven economy. For this reason, any value of b close to 1, such as 0.8 or 0.9 should be taken as an indication of potential violation of model assumptions. (Communication from Smirnov, 1/30/2006)

the employment in the basic sector. In the case of the spatial export base model, it is a three-sector model: global export (basic-2) – local export (basic-1) – non-basic employment. Eventually, the employment in the second basic sector determines the employment in all other sectors.

The addition of spatial interactions to regional export-base model introduces the concept of *regional neighborhood*. Regional neighborhood can be understood as the sphere of immediate economic influence of a county's economy. That influence is exerted via common infrastructure, economic linkages, shared labor pools, etc. Because most of these effects quickly decay with geographical distance, it is reasonable to assume initially that only cross-county border interactions affect neighboring counties. In this study, we use the physical contiguity criterion to define regional neighborhood.

This regional neighborhood is represented by the contiguity matrix. This is a matrix of zeros and ones, with an element S_{ij} equal to one if counties *i* and *j* are geographic neighbors. This denotes that these two counties may have close economic ties with each other and that their economic-bases are interdependent. In contrast, the element S_{ij} is equal to zero if two counties are not contiguous. The diagonal elements in the matrix are set to zero because our definition of global export excludes the county's output[5].

It should be noted that other neighborhood "constructs" could be used in this type of spatial modeling exercise. For example, a test of the hypothesis that the relationships among the different counties are a function of the cross-county trade flows rather than geographic adjacency would require generating a similar *spatial weights* matrix with elements S_{ij} equal to one if counties *i* and *j* pass a certain threshold of cross-county trade flows activity. Comparing the effect of the spatial linkages based on these two different notions of adjacency, would illustrate the relative strength of geographic neighborhood vs. trade flows on the economic influence exerted among these counties.

The principal distinction between the classical export-base model explained in Equations (1) and (2) and the modified spatial model explained in Equations (7), (8), and (9) is that for the latter, the export-base is segmented into two components and the "local" oriented export-base is linked directly to global export activities in the neighboring counties.

By combining Equations (7), (8), and (9), we obtain Equation (10):

$$X = \frac{1}{1-a}[b(E_g + E_g^l) + E_g] \qquad (10)$$

[5] For this updated analysis, the contiguity matrix was assembled using GeoDa[5]. The "Queen" concept from chess was chosen for calculating contiguity, which includes all the neighboring counties whether they are adjacent at a single point or have a common border with the county. This is in contrast to the "Rook" concept, which includes contiguous neighbors only if they share a border with the respective county.

which can be rearranged into Equation (11):

$$X = \frac{1+b}{1-a} E_g + \frac{b}{1-a} E_g^l \qquad (11)$$

Equation (11) is the reduced form of the spatial version of the export-base model. Both coefficients (*a*) and (*b*) are county-specific; however, in the case of the non-spatial version of the model, (a) alone would be the only parameter. Values of these parameters characterize the industrial mix of the regional economy at the aggregate level, based on the aggregation of NAICS-level estimates.

Two multipliers are important in this model. First, $\frac{1+b}{1-a}$ is the **Spatial version of the Regional Employment Multipliers (SREM)**, which denotes how much increase in employment in the county will occur from a unit increase in its global exports. The introduction of the spatial effects increases its value slightly from the value in the non-spatial version. The second multiplier $\frac{b}{1-a}$ measures the **Local Spatial Linkage (LSL)**, which indicates how much the employment in the county will increase as a result of a unit increase in the export-base employment in the neighboring counties.

Guided by this model, the Location Quotient (LQ) method[6] was used to calculate these multipliers. For each industry in a county, the LQ indicates the following: if the industry employs more (less) than the average in the reference area, which is the United States, we denote it as an export (local) industry. The LQ was also used to apportion the employment dedicated to export activities in an industry.

LQ values were computed for each of 85 industries in each of the 410 Appalachian counties and the U.S. (as the reference region) for 1997 and 2002.

In the spatial version of the export-base model, two regions are involved: one explicitly (the county in question) and one implicitly (the county's spatial neighbor(s) which includes itself). Building on this, we compute the local and global exports using the following process:

---

[6] The LQ was calculated as follows:

$$LQ = \left(\frac{E_{ij}}{E_{in}}\right) \Big/ \left(\frac{E_j}{E_n}\right) \qquad (12)$$

where, E_{ij} is employment of industry j in county i ; E_{in} is total employment in county i; E_j is employment of industry j in the whole United States; E_n is total employment in the whole United States. If employment data are unavailable, an analyst can use output, value added, or some other data that is available for each county.

First, we compute export-base employment of the county in question (county A) using the location-quotient method, and export-bases of all its individual neighboring counties. Summing these numbers, we obtain an estimate of neighborhood's aggregate exports, E_T. This value represents the sum of all local and global exports from the county and its spatial neighbor(s).

Second, we compute the export-base of an aggregated region, i.e., the region composed of the county and its spatial neighbor(s) including any contiguous non-Appalachian counties, denoting the result as E_G. This number represents the export-base of the aggregated region, or from the perspective of county A, total global exports.

Third, we compute the ratio $(1-\frac{E_G}{E_T})$, which represents the **Total Spatial Linkages (TSL)**. This ratio is always a positive number between zero and one. Its value depends on the industrial mix of the economy of county A and that of its spatial neighbor(s). A small value for the TSL ratio indicates that the economy of a county and its spatial neighbors have similar economic-bases (*competing* substitutes) and have limited interactions with each other. At the limit, if these economies have an identical industrial mix, the TSL ratio will be equal to zero. The value of the TSL ratio is higher when the economy of the spatial neighbor(s) complements that of county A. At the limit, when these economies are perfect complements and the industrial mix of the aggregated economy is identical to the reference area, the TSL ratio will be exactly one.

Using the TSL ratio $(1-\frac{E_G}{E_T})$, we compute E_g and E_s for county A:

$$E_s = (1-\frac{E_G}{E_T})E \qquad (13)$$

$$E_g = \frac{E_G}{E_T}E \qquad (14)$$

where E is the export-based employment and is equal to the sum of E_g and E_s.

Degree of Diversification in the Economy. S&S measured the degree of diversification (or concentration) of employment in a county by the percent of total employment accounted for by the top five industries[7]. For example, in Bibb County, Alabama, the top five industries listed in Exhibit 2-4 employ 55% of the total labor force, indicating a 55% degree of diversification. A large number indicates a high

[7] Other measures of industrial diversification may be used to give a different picture, for example, comparing the concentration by sector to the concentration in the region as a whole or to a larger reference region like the United States. This measure is often used in many 'diversity indices' used in the analysis of ethnic and racial diversity in urban areas. For the purpose of this paper, we followed the same diversification index used in the S&S (2000) paper to enable cross-comparison of the results.

concentration of a few industries in the county, and a low number indicates a more diversified economy.

Exhibit 2-4: Example of Degree of industry diversification

County FIPS, Name	Industry	Rank	Employment
01007 Bibb County, Alabama			
	92 Government & non NAICs	1	1,216
	230 Construction	2	621
	113 Forestry & Logging	3	324
	321 Wood Products	4	312
	814 Private households	5	307
	Industry Diversification (Percent of employment in top five industries):		55%

Source: MIT Multiregional Planning Research Group.

Classification of Counties by Growth Potential. S&S divided the counties into four groups based on the values of spatial regional employment multipliers (SREM) and local spatial linkages (LSL). In Exhibit 2-5, we define the criteria for the county typology, and in Exhibit 2-6, we illustrate this classification system. In the Appendix, we include the numerical thresholds used for the classification for 1997 and 2002 evaluation.

Exhibit 2-5: County Typologies

Type	Definition	Criteria
Type I	Counties with a strong economic-base, i.e., spatial regional employment multipliers (SREM) in top quartile, AND strong local spatial linkages (LSL).	SREM in top quartile **and** LSL in top half
Type II	Counties with strong local spatial linkages and a relatively strong economic-base relative to Appalachian counties, i.e., spatial regional employment multiplier in second quartile.	SREM in second quartile **and** LSL in top half
Type III	Counties with either a weak economic-base, i.e., spatial regional employment multipliers being less than the median, OR weak local spatial linkages	SREM in bottom half **or** LSL in bottom half (excluding Type IV)
Type IV	Counties with a weak economic-base, i.e., spatial regional employment multiplier in bottom quartile, AND weak local spatial linkages.	SREM in bottom quartile **and** LSL in bottom half

Source: Smirnov and Smirnova (2000).
SREM = Spatial Regional Employment Multipliers; LSL = Local Spatial Linkages

Exhibit 2-6: Calculations of County Typology

SREM / LSL	Top quartile *75%*	Second quartile *median*	Third quartile *50%*	Bottom quartile *25%*
Top half *Median*	**Type I**	**Type II**	**Type III**	**Type III**
50% **Bottom half**	**Type III**	**Type III**	**Type III**	**Type IV**

Source: MIT Multiregional Planning Research Group; based on Smirnov and Smirnova (2000).
SREM = Spatial Regional Employment Multipliers; LSL = Local Spatial Linkages

Data Methodology. While there are several sources of public and private employment data for the county-level economies, this updated analysis relies upon a current IMPLAN data set provided specifically for this analysis through the ARC. The data set covers all the 410 Appalachian counties as well as 137 contiguous non-Appalachian countries for 1997 and 2002. It covers 85 industries in each county, using the three-digit North American Industrial Classification System (NAICS) classification[8].

There are substantial methodological differences in the nature of data sets used in this report and the 2000 S&S study, which relied upon *Clean* CBP & REIS data sets:

- The IMPLAN data set is based on industry-level data with an algorithm to estimate suppressed data points, while the CBP data is the aggregate of establishment-level data (with data suppression issues). The result is slightly different notion of an 'industry' in both data sets.
- Each data set uses a different level of industry aggregation.
- IMPLAN uses NAICS codes, while CBP data used for the initial study was in terms of SIC codes.

Additional data issues are presented after the current analysis' results are compared to the original findings by Smirnov.

[8] This data set does not include the inter-industry trade relationship or the county-to-county trade flows. These data would be useful in getting a deeper and more detailed understanding of the cross-county and inter-industry dynamics using techniques like input-output analysis. Some of these additional data sets may be available commercially, but were not available for this study.

2.3 Overview of the Results

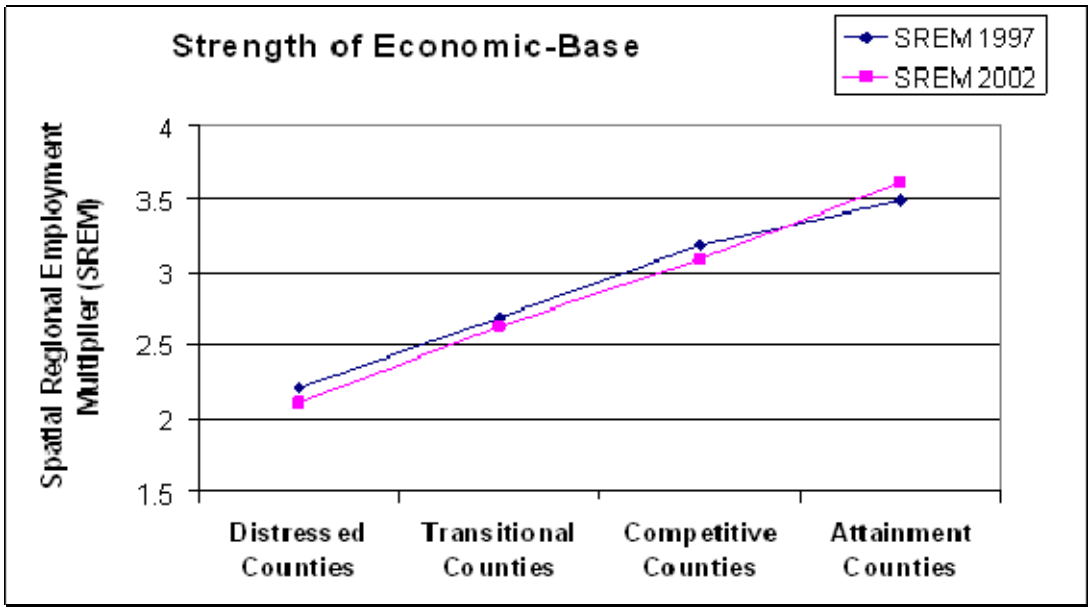
Using Structured Query Language (SQL), the following four indices from the Smirnov analysis were recomputed for each Appalachian county for 1997 -2002:

- Strength of economic-base using regional employment multipliers
- Strength of spatial linkages
- Degree of diversification in the economy
- Classification of counties by growth potential

Strength of the Economic-Base. The Spatial Regional Employment Multiplier (SREM) indicates the strength of the economic-base by measuring the number of new jobs generated in the county's economy as a result of an additional job in the export-base sector. To compare the SREM across the different types of economic-attainment counties, we calculate the average SREM for groups of counties based on their ARC designated economic status.

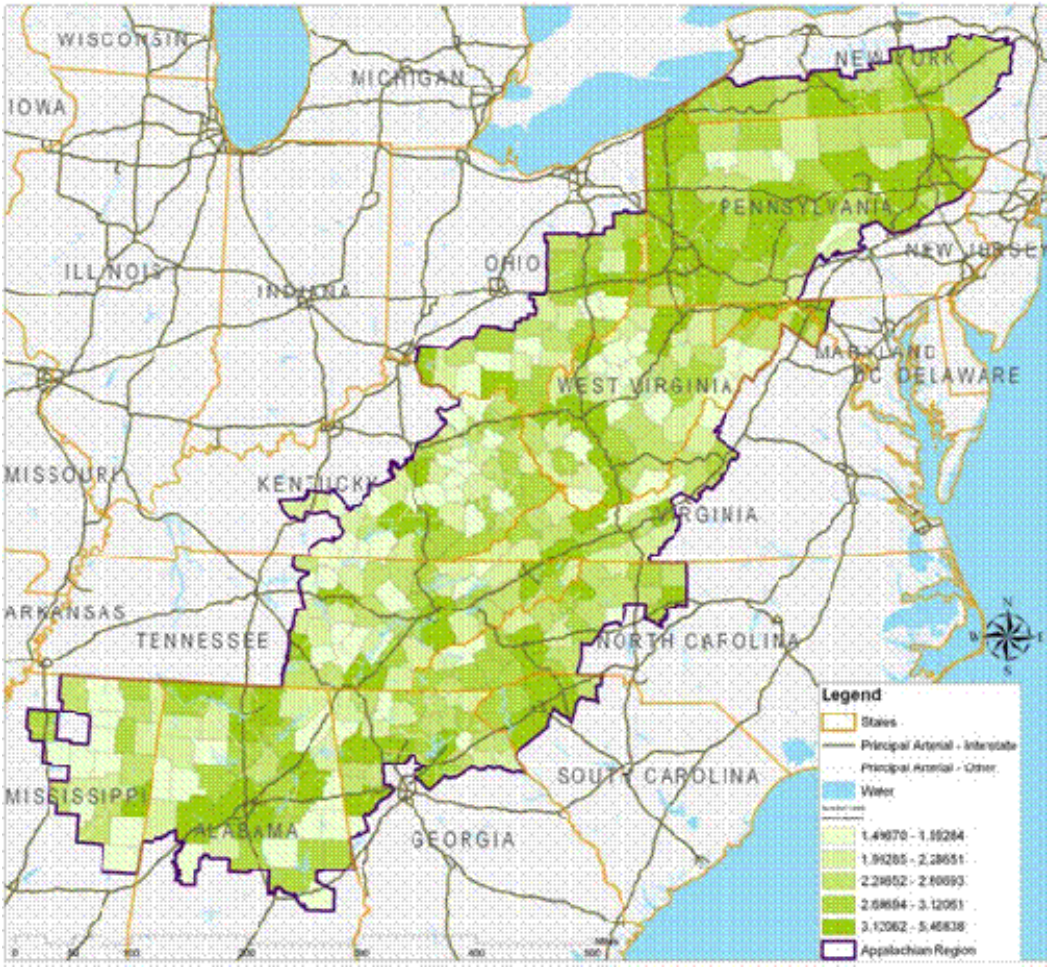
By examining these aggregate results for the Appalachian region (Exhibits 2-7 and 2-8), we identify two clear trends. First, there is a very limited (3%) difference between the SREM values across all counties between 1997 and 2002. Second, the SREM values increase linearly from the distressed counties to the attainment counties, indicating an increasing effect of the economic-base industries in the higher attainment counties. For example, in 2002, a new job in an export-based industry produced, on average, 2.1 jobs in a distressed county, compared to 3.6 jobs in an attainment county – a 58% difference.

Exhibit 2-7: Strength of economic-base* by ARC Economic Status Class



SREM = spatial regional employment multiplier; Source: MIT Multiregional Planning Research Group

Exhibit 2-8: **Mapped Distribution of the 2002 spatial regional employment multipliers (SREM)**



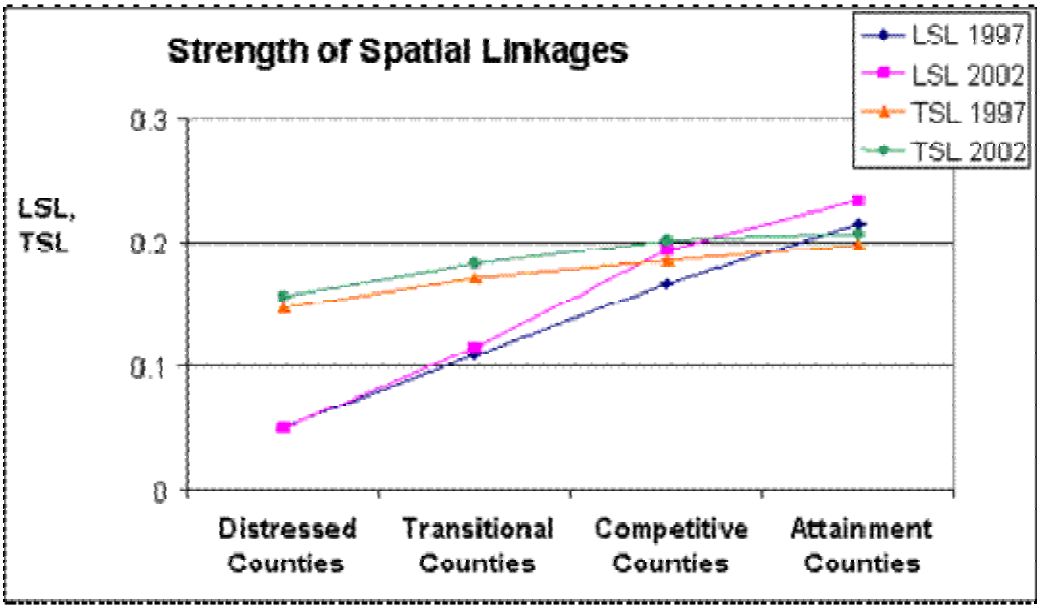
Source: MIT Multiregional Planning Research Group.

However, it is hard to specify the direction of the causality in this relationship. It could be that counties with industries that have higher SREM values have better opportunities for additional growth, as the export activity spurs forward and backward linkages. It could also be that counties that are economically developed have a more advanced and diversified economy such that the exporting firms can maximize local sourcing, rather than importing them from other counties. (The Appendix contains the complete SREM values for each of the 410 Appalachian counties for 1997 and 2002.)

Strength of Spatial Linkages. **"Local Spatial Linkage (LSL)"** is a measure of how much employment in a county will increase as a result of a unit increase in the export-base employment in the neighboring counties (Equation 11). LSL values (Exhibit 2-9 and 2-10) are significantly higher in competitive and attainment counties, compared to the distressed and transitional counties. This indicates that a county has higher

economic linkages with neighboring counties. For example, in 2002, LSL = 0.05 in distressed counties, compared to LSL = 0.23 in attainment counties. Higher LSL values suggest that neighboring economies are more integrated and, therefore, more responsive to economic policies. This may be a result of the local geography, where attainment counties may contain residential neighborhoods next to an industrial county, where the impact of jobs in the industrial county trickles down to the neighboring suburban residential county.

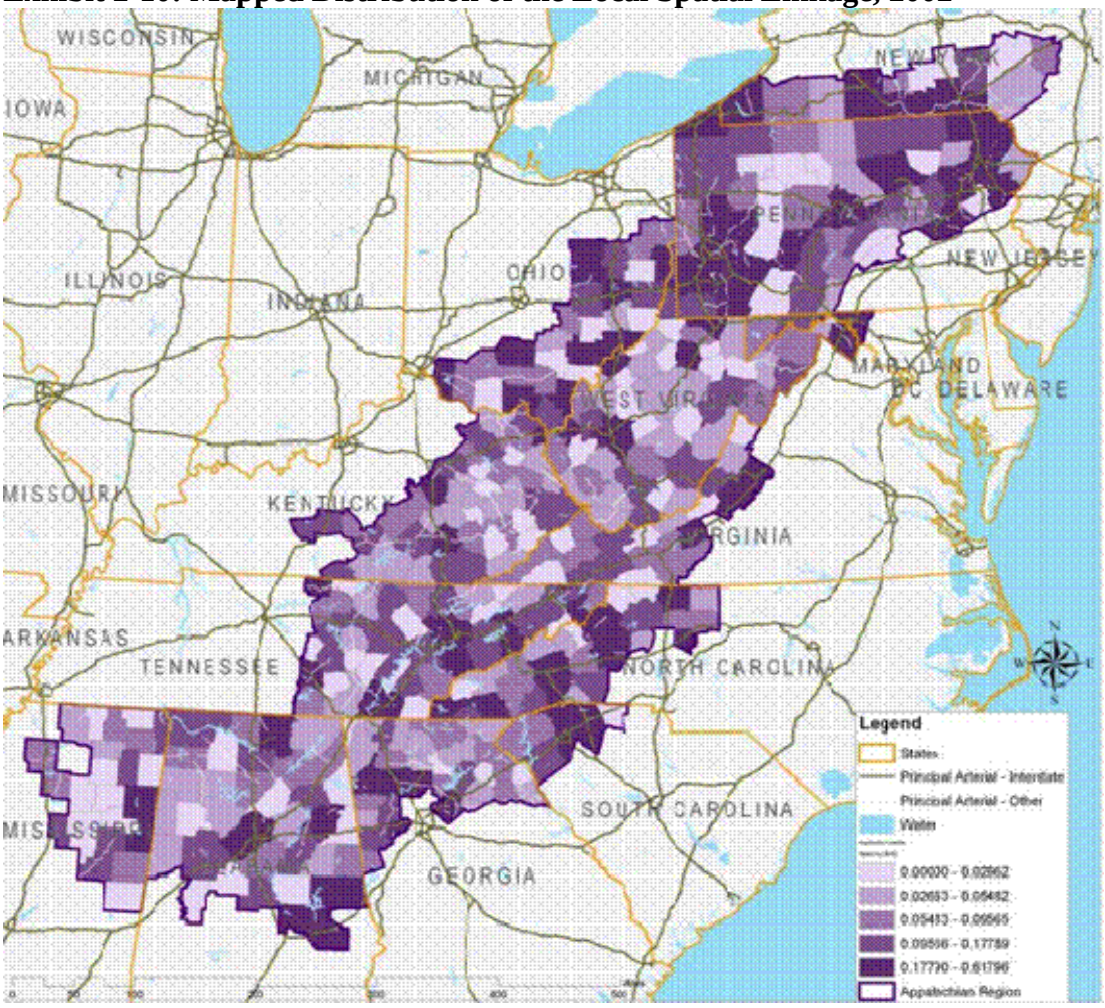
Exhibit 52-9: Strength of local spatial linkages (LSL) and total spatial linkages (TSL), 1997 and 2002



Source: MIT Multiregional Planning Research Group.

Total Spatial Linkage (TSL) is a measure of the similarities/differences in the industrial mix between a county and its spatial neighbor(s). TSL is a positive number between zero and one. A high TSL value indicates that the economy of the county is different and complements that of its spatial neighbor(s). A small value for TSL indicates similar economic-bases between the county and its spatial neighbors where they have limited interactions among each other (substitutes). TSL values (Figures 5.5) are higher for attainment counties indicating more complementarities with their spatial neighbors, compared to distressed counties that have more similarities with their spatial neighbors, indicating less potential for economic integration. For example, in 2002, TSL = 0.21 for attainment counties, compared to 0.16 for distressed counties.

Exhibit 2-10: Mapped Distribution of the Local Spatial Linkage, 2002



Source: MIT Multiregional Planning Research Group.

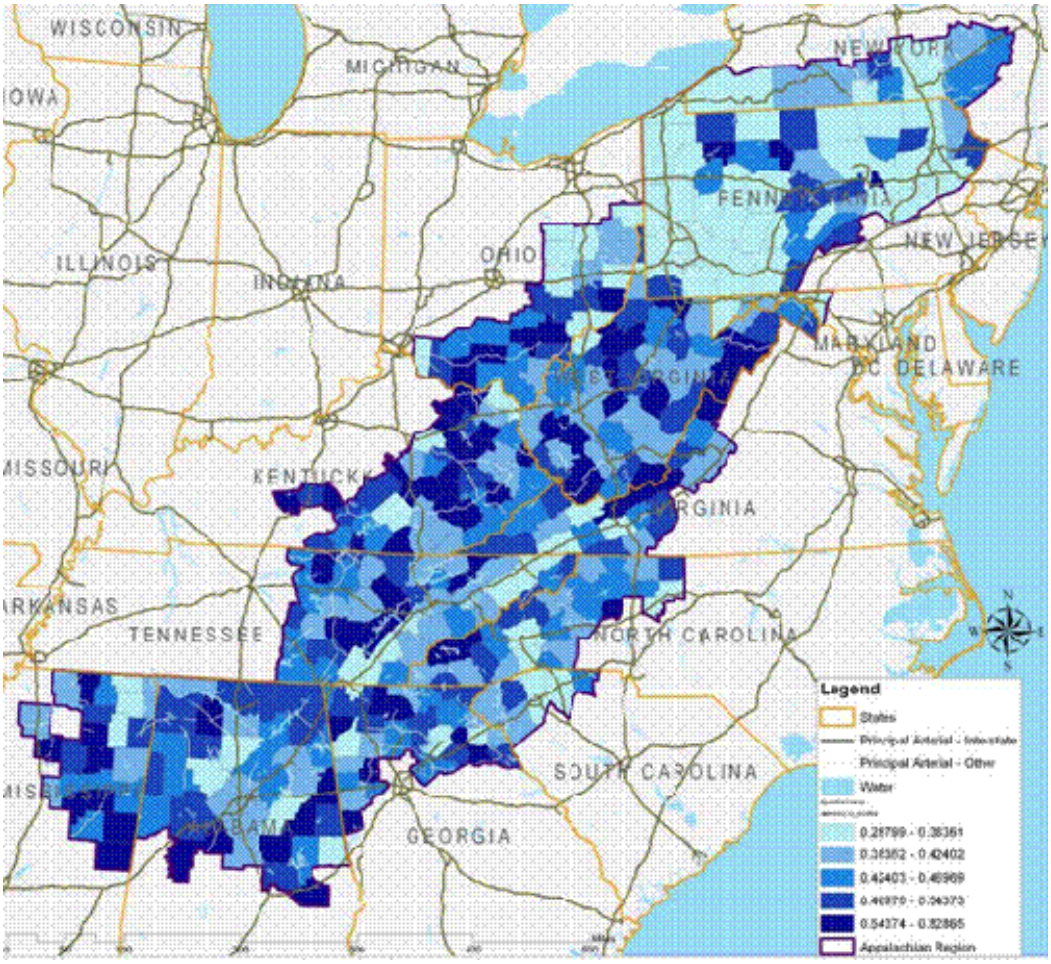
Degree of Diversification in the Economy. The degree of diversification or concentration of employment in a county is measured by the percent of total employment in the county tied to the top five industries. For 2002, 42% of the employment in the competitive and attainment counties was concentrated in the top five industries (Exhibits 2-11 and 2-12). However, the transitional and distressed counties had more concentration, with 45% and 53%, respectively. These values have changed little between 1997 and 2002, except for distressed counties, in which the concentration in the top five industries increased by 6.9% from 0.494 to 0.528. The industrial concentration in distressed and transitional counties indicates more vulnerability to cyclical recessions in these individual industries. Most of the distressed and transitional counties have small economies, where these top industries often represent a small number of establishments with large employment (Smirnov and Smirnova 2000), thus the impact of factory closures or relocation can significantly affect employment in the county economy.

Exhibit 2-11: Average values for Industry Diversification, by County economic-status

Economic-Status	1997	2002	Percentage Change (1997-2002)
Distressed	0.494	0.528	6.9%
Transitional	0.437	0.451	3.2%
Competitive	0.431	0.424	-1.5%
Attainment	0.422	0.425	0.6%

Source: MIT Multiregional Planning Research Group

Exhibit 2-12: Mapped Distribution of County-level Industry diversification in Appalachia, 2002



Source: MIT Multiregional Planning Research Group.

Classification of Counties by Growth Potential. Based on the results for 2002, the ARC county distribution among the S&S typology (Exhibit 2-13 and 2-14) is overall consistent with the economic development status of the counties, e.g., a large number of the distressed and transitional counties are classified as Type III and Type IV, while most of the competitive and attainment counties are classified as Type I and Type II. We can use this classification to help identify counties that could serve as "anchors" or "hubs" for a regional economic development strategy, e.g., Type I counties that are distressed (1) and transitional (81) have strong employment multipliers and local spatial linkages.

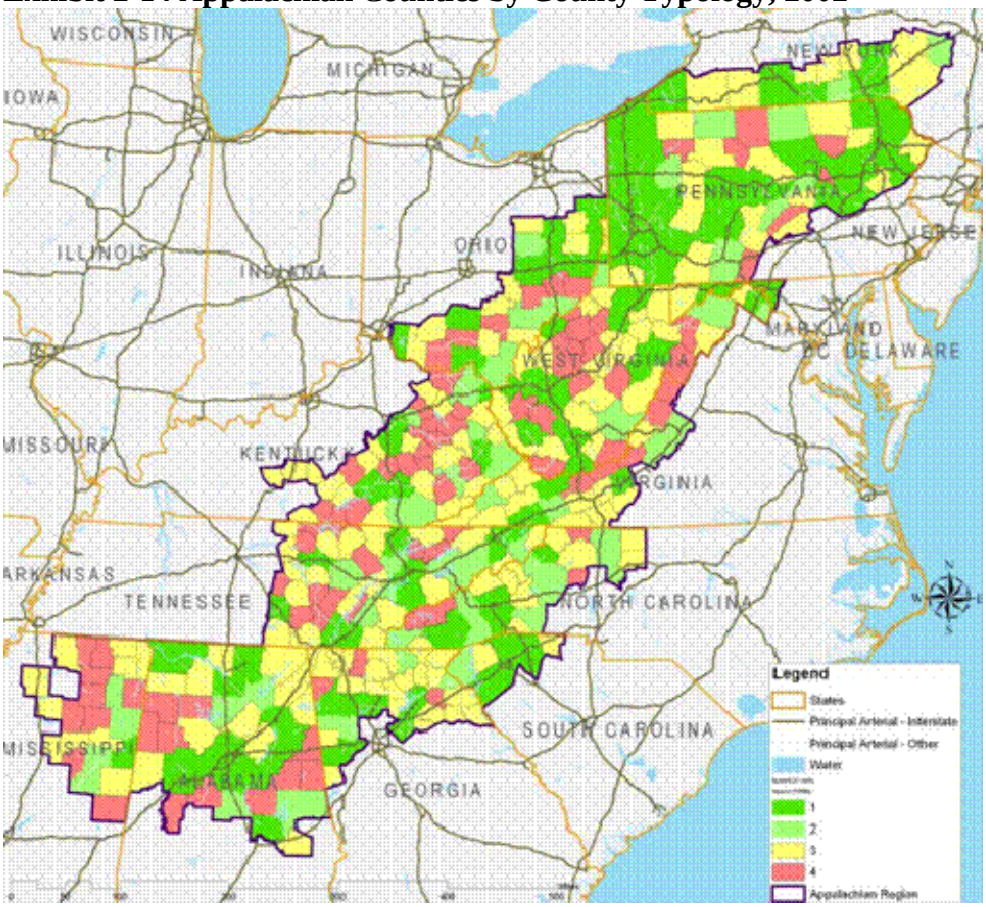
The transitional counties are more numerous than the set of distressed Appalachian counties and exhibit more heterogeneity (i.e., spread across the different types) in the composition of economic-base and therefore display a broader reaction to economic stimuli. Type I and II transitional economies are more likely to respond favorably to economic growth in the neighboring counties. In contrast, Type III and IV transitional and distressed counties will have less benefit. This suggests two policy implications. First, if officials target Type I and II counties for investments, they are likely to obtain a favorable growth response. Second, the overall effect in Appalachia of local initiatives will be higher for counties that are surrounded by Type I or II counties; and limited in the case of counties surrounded by Type III and IV counties, because all the linkages lead to outside-of-the-region interactions.

Exhibit 2-13: Appalachian Counties by S&S Typology and Economic Status

Economic Status	Type I	Type II	Type III	Type IV
Distressed	1	9	32	35
Transitional	81	52	118	52
Competitive	12	2	6	2
Attainment	5	1	2	0

Source: MIT Multiregional Planning Research Group.

Exhibit 2-14 Appalachian Counties by County Typology, 2002



Source: MIT Multiregional Planning Research Group.

2.4 Uses and Limitations of the Findings

This analysis provides some useful insights into the development potentials of the distressed and transitional counties based on their export-base. However these indices should not be used in a vacuum when making county-level policy decisions or investment allocations. This section points to some of the strengths and limitations of the methods and data under-pinning this analysis which can serve to both (a) assist users of this report in interpreting the spatial economic-base implications for their county(ies) of interest, and (b) guide future follow-up work that may utilize a similar methodology.[9]

Strengths of the Economic-Base Model. The computed indices may be useful at the aggregate level to provide a picture of the economic capabilities in the Appalachian

[9] This section benefited significantly from comments from Luc Anselin, Lisa Petraglia, Karen Polenske, Oleg Smirnov, and Glen Weisbrod.

region. By examining the results of this analysis in comparison with the results of the original S&S analysis, we can highlight three key points that illustrate the strength of this approach. First, the quantitative characteristics of the counties did not change significantly from 1997 to 2002. Second, when we do a back-of-the-envelope comparison of the county typology for some counties between the original S&S computations for 1996 and the 2002 computations done for the present study, we find limited change in how a county is rated Type I through IV. This is an indication of both the consistency of the methodology despite the change in data sources and aggregation, and it also shows that there was little change in the Appalachian counties during that period. However, we would need to conduct a systematic comparison between the results of the two analyses to confirm this point. Third, the current results when applying the S&S typology may explain some of the differences between attainment and distressed counties vis-à-vis their economic-bases and spatial linkages.

Limitations of this Analysis. The use of this analysis should be guided by the limitations of the theory, methodology, and data.

- **Economic-Base Model** - In general, the key limitation of the economic-base model is its sensitivity to definitional issues in the computation. Analysts using the economic-base model must make two theoretical assumptions: (1) the reference region is a closed-economy, i.e., all economic activities happen within the region, and there is no trade activity between the reference region and outside the region; (2) all counties throughout the region have identical productivity and consumption levels (Kim 1995).

  For the first assumption, we use the United States as our reference region, assuming that all U.S. export/import activities happen within the country, and no one county exchanges goods with areas outside of the United States. The United States was chosen as the reference area in this study in order to compare Appalachian counties with other U.S. counties in terms of their economic-base performance. However, this may have limitations in counties (Appalachian or not) that have significant exports to areas outside of the United States.

  For the second assumption, we assume that, throughout the United States, labor productivity as well as consumers' tastes and expenditure patterns, and households' income levels are identical. This assumption implies evenly distributed demand and supply of each product in proportion to the population within the reference area.

- **Location-Quotient (LQ) Method** - LQ is a useful technique to identify export-based industries in a region; however, its accuracy depends on many factors including the reference area and level of data aggregation.

  First, for the **reference area**: we performed the same analysis twice using *all of Appalachia* and then the United States as the reference areas, and noticed a significant difference in the LQ values. This difference would trickle down

through the computations, and would produce a different picture for the export-based industries. Although the results may remain similar across different time periods if the same computation method is used, analysts need to be careful in the interpretation of the results in either case.

Second, for the **level of data aggregation**: we use three-digit NAICS codes (85 industries) to calculate the LQs and identify export sectors. In theory, the results may vary depending on what data level of industrial classification an analyst uses to calculate the LQs. Using data at a more disaggregated level (larger number of industrial sectors), tends to produce more 'accurate' results.[10] For example, with an analysis at the three-digit NAICS code level, a researcher will not detect some detailed export-based industries due to aggregation bias; but, at a four-digit level of analysis, one or two sub-sectors may appear as export sectors. However, when we compare the county-level aggregate outcomes and the resulting county typology from the S&S paper with the current results, there are no significant *ordinal* changes in the relationships among the counties (the ranking and typology), yet *cardinal* differences do exist, i.e., differences in the values of the LQs and multipliers.

- **Spatial Linkages Concept.** Spatial linkages, as computed in this analysis, provides limited resolution as to the role of cross-sector linkages (input-output accounts would illuminate key inter-industry relationships capitalized upon in a county). Nor can one explicitly identify the role that a county's personal income (predominantly made up of wage earnings) plays in the strength of the spatial linkages when household fulfill their demands for goods and services. It is also important to keep in mind that the terms *multiplier* and *linkage* represent different concepts than those terms connote in traditional input-output analysis.

- **County Classification.** While the S&S county classification (Type I through IV) is a useful tool to avoid the variations in multiplier values due to the use of different data sets, two issues limit the usefulness of this classification. First, the two dimensions used in the county classification (SREM and LSL) are not orthogonal, i.e., they are correlated (SREM = (1/1-a) + LSL). The use of orthogonal dimensions is required for effective classification. Second, the classification does not take into account the standard error of the multiplier values. This would affect counties on the borderline between different types.

- **Data Issues and Comparability of Results.** Since the current analysis used a different source of data than the one used in the 2000 S&S report (IMPLAN vs. *Clean* CBP/REIS data), there are issues with the comparability of the results. These issues stem from the different levels of aggregation in the establishment/industry data sets. Specifically one is limited in making a direct comparison of individual values for multipliers for county-industry pairings. To reliably overcome this and be able to make comparisons of the results between the

[10] Consequently, using more aggregated data tends to produce higher values for the regional multipliers.

two analyses comparative ranking among the different counties/industries can be used. In doing so there is a strong correlation of the county classification results between the two reports, indicating a robustness of the results of the analysis at the aggregate level, despite the difference in the level of data aggregation, time period, industrial classification (SIC vs NAICs), and data source. This comparison also highlights the limited change in the (relative) economic structure in the Appalachian counties over the past decade.

Applying the Results of this Analysis. Given the strengths and limitations of this analysis, we describe different approaches to make use of this analysis in the field and the potential for future research studies that would build on this analysis.

First, using this analysis, we can create profiles for each county, highlighting the multipliers, the top industries, and the typology. However, the local county community cannot take solitary action based on these profiles since by definition they reflect the influences of neighboring counties. A second approach would be to use this analysis for a cross-county comparison to understand the relative characteristics of these counties. This may be useful to understand the relationships between economic attainment and the parameters computed in this analysis, e.g., the industry diversification or concentration, or the regional linkages. A third approach is to use the county typology to identify potential "growth hubs" at the regional level. This is similar to what S&S use in their paper (see Exhibit 5.1 above), where they identify counties with strong spatial linkages and economic-base as potential agents for triggering regional growth in their neighborhood. A fourth approach in using this analysis is to identify possible counties or groups of counties for future case studies to examine the spatial forces at work on each county in a neighborhood.

The most important point to emphasize in using such an analysis at the individual county level is that it is not unusual that the computed figures would vary from the reality in the individual counties. This is due to several factors in the data collection, measurement errors, aggregation effects, and assumptions embedded in the computation process. When using these results in individual counties, an analyst needs to do a "reality check" to ensure that the results are not anomalies. A reality check should turn up consistency with existing economic changes/transactions. This becomes crucial when communicating these results to local communities, or when using them for county-level decisions.

2.5 References

Fingleton, Bernard, Danilo C. Igliori, and Barry Moore. 2003. "Cluster Dynamics: New Evidence and Projections for Computing Services in Great Britain, Regional Economics," Paper presented at conference *Economic Geography and Clusters* (January). Cambridge, UK.

Kim, Hong-Bae. 1995. *Urban and Regional Economics: Analysis and Estimation.* Seoul: Kimundang.

Smirnov, Oleg, and Alena Smirnova. 2000. "An Assessment of the Economic-bases of Distressed and Near-Distressed Counties in Appalachia: A Report to the Appalachian Regional Commission." Washington, DC: ARC

Smirnov, Oleg. 2002. "Measuring Self-Sustainability of Economic Development at the County Level," The Annals of Regional Science. 36(4): 683-696.

3 TWIN COUNTIES STUDY UPDATE

"The Impact of Highway Investments on Economic Growth in the Appalachian Region, 1969-2000: An Update and Extension of the Twin County Study"

By Teresa Lynch, Economic Development Research Group

3.1 Introduction

This chapter estimates the impacts of highway investments on economic growth in Appalachian counties between 1969 and 2000. The chapter has two objectives. The first objective is to update the 1995 study by Isserman and Rephann (I&R), which found statistically significant differences in economic growth rates of ARC counties when compared to their non-ARC counterparts in the 1965-1991 period, and that counties served by the Appalachian Development Highway System (ADHS) had even higher rates of income, population, and per capita income growth than otherwise similar (non-ARC) counties (1995; p.359). We extend this analysis to year 2000.

The second objective is to determine whether the amount, characteristics, and timing of ADHS investments can explain some of the differences in economic outcomes. In the Isserman and Rephann study, "ARC program variables are almost never statistically significant" (p.362), a finding we hypothesized might be due to the blunt measures of ARC program variables used in that study. To improve the quality of the highway investment variable, we surveyed state DOTs on the timing and characteristics of ADHS segments in their states, including construction start and end dates, section length, number of lanes, access type, number of signalized intersections, and number of interchanges. All thirteen ARC states participated fully in the survey process.

The critical empirical finding of this research is that (on average) the gap between ARC counties and their twins grew significantly in the 1990s. Relative to their non-ARC county twins, income in ARC counties had grown 131% more over the 1969 to 2000 interval; earnings growth was 96% higher; population growth was 9% higher; and per capita income was 36% higher. The performance of ARC counties with ADHS segments relative to their twins was even more impressive: income growth alone was over 200% higher for the 1969 to 2000 interval. The overall performance on the ARC region during this period, though, should not mask the struggles that pockets within ARC have experienced: performance in the northern part of the ARC

regions lagged its non-ARC twins and across the region, smaller metropolitan areas fell far behind their non-ARC counterparts.

The critical methodological finding from this chapter is that one reason top-down methodologies approaches have often failed to establish a link between highway investments and Appalachian development is poor measurement of highway investments. Using the improved highway measures afforded by our survey, we were able to establish a statistical link between ADHS investments and differential income and earnings growth between ARC counties and their twins.

We found that better measures of highway investment characteristics (e.g., new versus replacement investment; length of segment relative to county size) generated explanatory relationships that were statistically significant and robust, whereas poor measures of investment did not. This suggests that when characteristics of the proposed highway investments are properly measured, there is empirical support for claims that highway investments--here in the form of the ADHS investments--contribute to economic growth.

3.2 Appalachian Growth, 1969-2000

A key question for national policy makers and ARC members, partners, and staff concerns the effectiveness of different ARC programs on improving economic outcomes in Appalachia. Isserman and Rephann's 1995 study--which was subtitled "An Empirical Assessment of 26 Years of Regional Development Planning"--compared economic growth in Appalachian counties to growth in a control group of non-Appalachian counties ("twins"). The purpose of the control group is to proxy what would have otherwise occurred (in terms of growth) without ARC funding. The authors posit that once identified, the difference in the mean cumulative growth rates informs us whether there are real growth gains for the Appalachian county. To complete the study's objective, the authors attempted to identify the causal factors (through regression analysis) behind *significant* real growth differentials in favor of Appalachian counties.

Clearly then, much rests upon (a) the methods to select a non-Appalachian county twin, and (b) assessing how suitable each "match" is before advancing the growth analysis. The set of 391 non-Appalachian twin counties identified by Isserman and Rephann are used in our current update of their analysis which follows.

Eligible non-Appalachian counties for selection as a possible match were predicated on the following:

- The county's population centroid had to be at least 60 miles away from the Appalachian border
- Comparable growth in personal income, earning by sector over the period 1950-1959

- Comparable economic structure (earnings by sector) and population in 1959

Since a qualifying non-Appalachian county might provide a match to more than one Appalachian county, the final matching was guaranteed to reflect the optimal set by applying a distance weighting on the proposed pairs in the set of 391 Appalachian counties. The solution that had the minimum Mahalanobian distance[11] defined the optimal pair matches. The validity of the 391 match counties to serve ultimately as the "counter-factual" for Appalachian growth over the 1969-1991 period in the absence of ARC investments was confirmed statistically by the authors albeit with a slight bias.[12]

Isserman and Rephann (referred to here as "I &R") found that on average, ARC counties outperformed their twins by significant margins over the 1969-1991 period: income and earnings growth in ARC counties was 48% higher (cumulatively) while per capita income growth was 17% higher. These differences were statistically significant (at the 10% level). The results were more ambiguous when county type was taken into account: large metropolitan (statistically insignificant however) and non-metropolitan counties (particularly those in the *Central* Appalachian subregion) fared much better than their twins, but smaller metropolitan areas (those with populations under 250,000) demonstrated a statistically significant finding of lower income, earnings, and per capita income growth than their twins. For non-metro areas, income, earnings, and per capita income differences were statistically significant.

These findings only reflect performance through 1991, neglecting the question of how ARC counties fared during the 1990s. To answer this question, we use the same data and the same control group as Isserman and Rephann (I&R). The data are from the U.S. Bureau of Economic Analysis and provide information on population, personal income by source, and earnings by industry by county for 1969-2000. These data, termed the "REIS" data,[13] provide a long time series and do not suffer from the data suppression issues that other potential data sources (e.g., County Business Patterns) do. We also use the same control group, namely the "twin county" matches developed by I&R and used in different studies of the Appalachian region.[14]

Exhibits 3-1, 3-2 and 3-3 provide the relevant data on ARC growth since 1969. Exhibit 3-1 reproduces the mean growth rate differences between Appalachian counties and their twins for the period 1969-1991 reported by I&R. Exhibit 3-2 presents updated estimates of the 1969-1991 mean growth rate differences using the most recent REIS data.[15] (The latter estimates are expected to differ from those of

[11] Mahalanobian distance accounts for correlations between variables, as discussed in Isserman & Rephann (1995)
[12] Over the 1950-1959 period the Appalchian counties exhibitied a slightly more moderate rate of growth than the 391 non-Appalachian match counties – a manifestation that Appalachian counties pre-ARC investments (1965 inception) were uniquely disadvantaged locations. This bias would only serve to understate the role of ARC investments over 1969-1991 should significant, positive growth differentials be observed.
[13] "REIS" is the acronym for "Regional Economic Information System."
[14] We thank Andrew Isserman for providing a list of the county matches used in Isserman and Rephann, 1995.
[15] REIS data used in this report were downloaded in late 2005.

I&R in Exhibit 3-1 because of changes in methods used in REIS, as well as the periodic updating of data sets by BEA.) Exhibit 3-3 presents mean growth rate differences between Appalachian counties and their twins for the 1969-2000 period.

Two matters stand out about the data. The first is that the more recent REIS data (shown in Exhibit 3-2) show a somewhat different picture of ARC performance for 1969-1991 than presented by I&R (shown in Exhibit 3-1). Both data sets show that ARC counties outperformed their twins across all measures in the 1969-1991 period; that certain characteristics (e.g., presence of ADHS segment) are associated with strong economic performance and others (e.g., metropolitan status with less than 250,000 in population) with weak performance; and great variability in performance of ARC counties by region and state. The more recent data, though, suggest that income growth was significantly higher in ARC counties than previously thought (68% higher than their twins between 1969 and 1991 compared to 48% in I&R); that the northern region of ARC outperformed its twins between 1969 and 1991; and the southern ARC region had more noticeably outperformed their twin counties with respect to income growth (aggregate and per capita) and earnings growth than originally measured.

Exhibit 3-1. Isserman & Rephann's Reported Mean Growth Rate Differences, 1969-1991

	Income	Earnings	Population	Per Capita Income	Manufacturing	Retail Trade	Services	No. of Counties
Appalachia	48%	48%	5%	17%	87%	67%	138%	**391**
Northern	-6%	-11%	-3%	7%	-76%	13%	46%	**143**
Central	101%	92%	7%	51%	427%	99%	131%	**86**
Southern	68%	78%	10%	8%	63%	99%	222%	**162**
Alabama	8%	33%	1%	-4%	94%	33%	127%	**35**
Georgia	199%	262%	35%	7%	101%	247%	689%	**35**
Kentucky	118%	105%	7%	68%	530%	112%	147%	**49**
Maryland	112%	95%	5%	72%	77%	173%	167%	**3**
Mississippi	27%	7%	7%	-17%	55%	60%	95%	**18**
New York	-2%	-3%	-2%	5%	1%	-4%	0%	**14**
North Carolina	53%	21%	0%	40%	-49%	101%	139%	**29**
Ohio	-11%	-2%	3%	-23%	-20%	-29%	36%	**28**
Pennsylvania	6%	-2%	-2%	16%	-70%	39%	58%	**52**
South Carolina	151%	130%	24%	12%	98%	191%	87%	**6**
Tennessee	68%	72%	10%	8%	277%	90%	119%	**50**
Virginia	36%	-18%	-3%	46%	191%	-38%	79%	**17**
West Virginia	-26%	-26%	-8%	15%	-179%	9%	22%	**55**
Metropolitan	50%	64%	8%	4%	110%	70%	205%	**95**
<250,000	-65%	-86%	-11%	-8%	-160%	-42%	-11%	**27**
Non-metro	48%	43%	4%	22%	80%	66%	115%	**296**
Appalachian HWY	69%	49%	6%	32%	61%	78%	92%	**110**
Interstate HWY	41%	48%	4%	15%	125%	70%	148%	**152**
Growth Center	37%	40%	4%	14%	101%	62%	85%	**90**
Coal Producing	51%	41%	1%	38%	77%	47%	73%	**148**
Distressed County	48%	31%	2%	28%	168%	55%	92%	**113**

Note: **Boldface** indicates significance at the 10 percent level.

Exhibit 3-2. Recent REIS Data Calculated Mean Growth Rate Differences, 1969-1991

	Income	Earnings	Population	Per Capita Income	MFG	Retail Trade	Services	No. of Counties
Appalachia	**68%**	**59%**	**6%**	**27%**	79%	**66%**	**170%**	**391**
Northern	**8%**	**3%**	-2%	**16%**	-85%	29%	**69%**	**143**
Central	**119%**	**89%**	**7%**	**57%**	**346%**	**69%**	**195%**	**84**
Southern	**94%**	**92%**	**11%**	**21%**	93%	**98%**	**248%**	**164**
Alabama	51%	56%	2%	22%	105%	44%	**179%**	**35**
Georgia	**221%**	**278%**	**38%**	9%	64%	**224%**	**741%**	**35**
Kentucky	**134%**	**96%**	**7%**	**61%**	517%	69%	**235%**	**49**
Maryland	110%	107%	5%	67%	129%	158%	248%	**3**
Mississippi	0%	-39%	5%	-26%	-1%	**55%**	9%	**18**
New York	6%	10%	-25%	-3%	-6%	14%	23%	**14**
North Carolina	**87%**	40%	-1%	**60%**	-32%	78%	126%	**29**
Ohio	8%	12%	2%	-3%	25%	2%	-36%	**28**
Pennsylvania	14%	6%	-1%	**20%**	**-65%**	**46%**	**78%**	**52**
South Carolina	**158%**	**148%**	**24%**	17%	**129%**	**196%**	12%	**6**
Tennessee	**113%**	**98%**	**11%**	**36%**	**257%**	**102%**	**167%**	**50**
Virginia	7%	-30%	-3%	25%	212%	-28%	110%	**17**
West Virginia	-2%	-3%	-6%	**26%**	**-225%**	23%	107%	**55**
Metropolitan	**84%**	**80%**	9%	**21%**	147%	71%	**198%**	**76**
<250,000	**-53%**	-57%	**-10%**	0%	-90%	-26%	63%	**31**
Non-metro	**62%**	**51%**	**4%**	**29%**	52%	**65%**	**160%**	**284**
Appalachian HWY	**92%**	**69%**	**7%**	**42%**	147%	**81%**	**194%**	**139**
Interstate HWY	**63%**	**60%**	5%	**27%**	125%	**69%**	**153%**	**162**
Growth Center	**79%**	**87%**	**8%**	**28%**	42%	**121%**	**175%**	**124**
Coal Producing	**74%**	**67%**	3%	**40%**	93%	**53%**	**142%**	**134**
Distressed County	**69%**	33%	3%	**40%**	139%	**48%**	**169%**	**115**

Note: **Boldface** indicates significance at the 10 percent level.

Exhibit 3-3. Recent REIS Data Calculated Mean Growth Rate Differences, 1969-2000

	Income	Earnings	Population	Per Capita Income	MFG	Retail Trade	Services	No. of Counties
Appalachia	**131%**	**96%**	**9%**	**36%**	132%	**127%**	**424%**	391
Northern	**-34%**	-48%	-5%	8%	-151%	0%	**77%**	143
Central	**191%**	**84%**	5%	**93%**	625%	**131%**	**387%**	84
Southern	**245%**	**228%**	**22%**	**31%**	146%	**236%**	**757%**	164
Alabama	4%	-33%	-1%	-5%	-35%	-31%	183%	35
Georgia	**780%**	**933%**	**79%**	**32%**	**583%**	670%	**2940%**	35
Kentucky	**205%**	79%	6%	**94%**	**1181%**	**128%**	**437%**	49
Maryland	160%	101%	4%	88%	-46%	123%	521%	3
Mississippi	34%	-12%	6%	-15%	-26%	**138%**	67%	18
New York	-54%	-47%	-8%	7%	-75%	-69%	19%	14
North Carolina	**194%**	70%	4%	**116%**	-166%	177%	356%	29
Ohio	-20%	-8%	-1%	-15%	-63%	-14%	-97%	28
Pennsylvania	-7%	-12%	-1%	15%	-130%	24%	46%	52
South Carolina	**308%**	**236%**	**34%**	15%	**149%**	**465%**	117%	6
Tennessee	**239%**	**134%**	**19%**	**54%**	203%	**249%**	**319%**	50
Virginia	-35%	-73%	-9%	44%	15%	-79%	205%	17
West Virginia	-80%	-98%	**-13%**	18%	**-265%**	-3%	174%	55
Metropolitan	**201%**	186%	17%	15%	146%	157%	**770%**	76
<250,000	**183%**	**-200%**	**-17%**	**-40%**	**-436%**	**-164%**	13%	31
Non-metro	**105%**	**62%**	**5%**	**44%**	127%	**116%**	**292%**	284
Appalachian HWY	**202%**	**117%**	**12%**	**63%**	96%	**163%**	**516%**	139
Interstate HWY	93%	117%	6%	**23%**	333%	108%	**426%**	162
Growth Center	**133%**	182%	9%	**40%**	102%	**229%**	**510%**	124
Coal Producing	**96%**	50%	1%	**54%**	92%	**70%**	**284%**	134
Distressed County	**96%**	3%	0%	**72%**	456%	**76%**	**250%**	115

Note: **Boldface** indicates significance at the 10 percent level.

The second noteworthy finding concerns the performance of ARC counties in the 1990s. As the data in Exhibit 3-3 show, by 2000, income in ARC counties had grown 131% more since 1969 than in the non-ARC counties; earnings growth was 96% higher; population growth was 9% higher; and per capita income was 36% higher. Mean growth rate differences (relative to twins) in counties with ADHS segments grew from 92% for the 1969-1991 period to 202% for the 1969-2000 period. At the same time, the 1990s saw the northern region of ARC fall behind its non-ARC counterparts; and income and earnings growth in the 31 smaller metropolitan counties (populations less than 250,000) dropped from about 50% less than their twins through 1991 to about *200*% less than their twins by 2000.

The performances of individual states also varied widely, ranging from 80% less than the twins to 780% more. Interestingly, the states that performed best (and significantly so) relative to their twins (Georgia, Kentucky, and South Carolina) seemed to do so in part on the strength of their performances in manufacturing.

3.3 The Role of Highway Investments

By adopting the "twin county" approach, itself a version of the comparison group methodology, we share an important assumption with I&R: that differences in growth rates between ARC counties and their twins represent "what would have happened in Appalachia without the ARC," i.e., without ARC programs. Although I&R were unable econometrically to establish a robust relationship between ARC programs (growth centers, distressed counties, and highway investments) and economic outcomes in Appalachian counties, it is possible that their results reflect poor measurement of program variables rather than weak program effectiveness. The poor quality of program measures is evident in the treatment of highways in their regression model: I&R roll ADHS and interstate highway investments into one binary variable ("Highway in County"), which takes a value of "1" if the county is home to at least 3 miles of ADHS or interstate and a "0" otherwise. The crudeness of this measure, we believed, might be the reason it was not possible to establish a statistical relationship between highway investments and economic growth.

To improve the quality of the highway investment variable, we surveyed state DOTs regarding the timing and characteristics of ADHS segments in their states, including construction start and end dates, section length, number of lanes, access type, number of signalized intersections, and number of interchanges. (A sample survey is presented at the end of this chapter.) Each of the 13 ARC states participated fully in the survey. Survey data were added to the REIS data on economic performance to create a dataset of highway investments and economic outcomes.

Before testing the new dataset for causal determinants of growth differentials between Appalachian counties and their twins, we attempt first to reproduce I&R's findings for the 1969-1991 period, then extend their analysis to year 2000. The results are presented in Exhibit 3-4, which show reasonable consistency with I&R's results. Specifically, for the analysis of income growth in ARC counties and their twins in the 1969-1991 period ("INC 91"), the two sets of findings are in accordance on the sign and significance of 14 of 18 of the variables used in the original I&R model specification. For the analysis of earnings growth ("EARN 91"), the analyses are also in accordance on 14 of the 18 variables. Some of the differences that do exist can likely be attributed to how the variables were constructed. (For example, the economic structure variables used in I&R are defined as the contribution of farm, manufacturing, retail, and government sectors to county total income in 1959, while this analysis used 1969 data because of issues of timing and data availability.) Others

are likely due to differences in old and new REIS estimates of earnings and income for this period.

Despite these differences, the current analysis reproduces the key finding of the original I&R analysis: that the presence of an interstate and/or ADHS highway segment cannot explain earnings or income growth patterns in ARC counties in the 1969-1991 period. (However, unlike the findings of I&R, the "highway" variable is positively and significantly correlated with per capita income, a finding that should be further explored in a later study.) These results also hold when the analysis is extended to examine the difference in income or earnings growth between 1969 and 2000 ("INC 00" and "EARN 00").

Exhibit 3-4. Regression Results Using Isserman and Rephann Specification
(dependent variable is differential Income or Earnings growth by 1991 or 2000)

Explanatory Variable	**INC 91**	**INC 00**	**EARN 91**	**EARN 00**
(Constant)	1.273	4.243	.645	1.269
South Region	**1.010**	**3.071**	**1.059**	**2.692**
Central Region	**1.154**	**2.308**	**1.019**	**1.630**
Distance to City of 25,000	**.014**	**.049**	**.015**	**.056**
Distance to City of 100,000	-.006	**-.023**	***-.008***	***-.023***
Distance to City of 250,000	-.003	***-.015***	**-.003**	**-.012**
Distressed Counties 1990	-.159	-.660	***-.663***	-1.187
Growth Center	-.108	-.596	-.059	-.217
Coal Producing	*.313*	*.278*	.443	.359
Mahalanobis Distance	***-.039***	-.078	-.004	-.011
Population Density, 1960	-.001	-.003	-.001	-.002
% Farm in Earnings, 1969	-.018	-.016	**-.038**	*-.052*
% Manu in Earnings, 1969	**-.026**	**-.080**	**-.026**	**-.062**
% Ret Trade in Earnings, 1969	-.001	.024	.025	.092
% FedGovCiv in Earnings, 1969	.025	-.041	.043	-.055
% FedMil in Earnings, 1969	-.090	-.282	-.079	-.199
% St/Local in Earnings, 1969	.014	.001	***.039***	.068
Population Growth Rate, 1950-60	**.022**	**.060**	**.021**	**.059**
ADHS or Interstate	.204	.641	-.079	.359

Bold indicates the regression coefficient is significant at the 10 percent level in both analyses;
Bold italics indicates variable is significant in current analysis but not in I&R analysis;
Italics indicates variable is significant in I&R but not in current analysis

For the second part of the analysis, we refined I&R's single "highway" variable by decomposing it into its component parts, ADHS and interstate investments. Using a model specification that mimics the I&R model in all ways except that the "highway" variable is now disaggregated into separate "Interstate" and "ADHS" components, we

find that the presence of an ADHS segment in a county can in fact explain a portion of differential income growth for 1969-1991 ("INC 91") and 1969-2000 ("INC 00"), as well as differential earnings growth in the 1969-2000 period ("EARN 00"). These results are presented in Exhibit 3-5.

Exhibit 3-5. Regression Results Delineating Interstate and ADHS Investments
(dependent variable is differential Income or Earnings growth by 1991 or 2000)

Explanatory Variable	INC 91	INC 00	EARN 91	EARN 00
(Constant)	1.355	4.669	.600	1.365
South Region	**1.000**	**3.033**	**1.054**	**2.667**
Central Region	**1.129**	**2.210**	**1.009**	1.575
Distance to City of 25,000	**.013**	**.045**	**.015**	**.054**
Distance to City of 100,000	**-.008**	**-.028**	**-.009**	**-.027**
Distance to City of 250,000	-.003	**-.013**	-.002	**-.012**
Distressed County	-.149	-.627	-.654	-1.161
Growth Center	-.113	-.603	-.076	-.243
Coal Producing	.289	.209	.424	.294
Mahalanobis Distance	**-.040**	-.086	-.005	-.013
Population Density, 1960	-.001	-.003	-.001	-.002
% Farm in Earnings, 1969	-.017	-.015	**-.037**	-.051
% Manu in Earnings, 1969	-.025	**-.076**	**-.025**	**-.059**
% Ret Trade in Earnings, 1969	-.003	.017	.024	.087
% FedGovCiv in Earnings, 1969	.025	-.039	.044	-.055
% FedMil in Earnings, 1969	-.080	-.245	-.068	-.170
% St/Local in Earnings, 1969	.015	.005	**.041**	.072
Pop. ulation Growth Rate, 1950-60	**.022**	**.062**	.021	**.059**
Interstate	-.059	-.569	-.181	-.194
ADHS	**.421**	**1.552**	.207	**1.003**

Bold *indicates the regression coefficient is significant at the 10 percent level*

To get yet a better measure of highway investments, in the third part of the analysis we use survey results to refine the "ADHS" variable to reflect the size (in lane-miles) of the segment relative to the size of the county; and the type of investment (new, widen, or replace) represented by each segment. These data were combined to produce estimates of lane-miles per county for 1991 and 2000, which were then refined by dividing by the land area in each county. This calculation yielded an estimate of the size of each type of ADHS segment relative to county size for 1991 and 2000.

Using these measures of highway investments confirms a relationship between ADHS investments and county-level income and earnings growth differentials relative to the non-ARC twin outcomes. However, as shown in Exhibit 3-6, the effect on earnings growth does not appear in the 1969-1991 growth rates but emerges for the 1969-2000 growth rates, supporting the hypothesis that business sector response to highway improvements is slower than the residential sector. (Note: income measures are by place of residence, earnings are by place of work.) This interpretation gets further support from the results in Exhibit 3-7, which show that when the highway investment variable refers to investments in place by 2000 (rather than those in place by 1991, as

in Exhibit 3-6), the impact on income and earnings growth is smaller.

Exhibit 3-6. Results Using 1991 ADHS Segment Length Relative to County Size
(dependent variable is differential Income or Earnings growth by 1991 or 2000)

	INC 91	INC 00	EARN 91	EARN 00
(Constant)	1.397	4.631	.537	1.154
South Region	**1.019**	**3.123**	**1.033**	**2.664**
Central Region	**1.227**	**2.663**	**.978**	**1.703**
Distance to City of 25,000	**.013**	**.042**	**.015**	**.053**
Distance to City of 100,000	-.006	**-.022**	**-.008**	**-.023**
Distance to City of 250,000	-.003	**-.014**	-.002	**-.012**
Distressed Counties 1990	-.138	-.529	**-.642**	-1.075
Growth Center	-.094	-.520	-.083	-.213
Coal Producing	.407	.651	**.479**	.553
Mahalanobis Distance	**-.042**	-.092	-.006	-.015
Population Density, 1960	-.001	-.003	-.001	-.002
% Farm in Earnings, 1969	-.020	-.024	**-.037**	-.053
% Manu in Earnings, 1969	**-.026**	**-.078**	**-.024**	**-.058**
% Ret Trade in Earnings, 1969	-.004	.010	.026	.087
% FedGovCiv in Earnings, 1969	.026	-.035	.046	-.048
% FedMil in Earnings, 1969	-.085	-.240	-.066	-.157
% St/Local in Earnings, 1969	.011	-.006	**.039**	.067
Population Growth Rate, 1950-1960	**.023**	**.060**	**.021**	**.058**
Interstate	-.104	-.702	-.190	-.239
NewPerMileLandArea91	**4.550**	**22.146**	2.063	**14.249**
ReplacePerMileLandArea91	-2.125	-4.234	-2.204	-3.092
WidenPerMileLandArea91	-1.270	-5.317	2.334	2.987

The findings in Exhibit 3-6 also suggest that only some types of investments are likely to influence local economic activity. As the results in Table 6 show, the variable that measures lane miles of new highway construction ("NewPerMileLandArea91") is positive and significant in the income and earnings growth equations for the 1969-2000 period. The variables for "replaced" and "widened" lane-miles per land area, however, are not significant for income or earnings in either period. The "NewPerMileLandArea91" variable is also significant in the 1969-1991 period for the income variable, although the effect is larger for the 1969-2000 period. Because the vast majority (80+ %) of lane-mile investments in place in 2000 were actually made pre-1991, these findings also suggest that there is a considerable lag between highway investments and their full effect on economic growth.

Exhibit 3-7. Results Using 2000 ADHS Segment Length Relative to County Size
(dependent variable is differential Income or Earnings growth by 2000)

Explanatory Variable	INC 00	EARN 00
(Constant)	4.727	1.147
South Region	**3.037**	**2.588**
Central Region	**2.438**	1.532
Distance to City of 25,000	**.045**	**.055**
Distance to City of 100,000	**-.023**	**-.025**
Distance to City of 250,000	**-.014**	**-.012**
Distressed Counties 1990	-.509	-1.077
Growth Center	-.527	-.256
Coal Producing	.552	.422
Mahalanobis Distance	-.092	-.017
Population Density, 1960	-.003	-.002
% Farm in Earnings, 1969	-.022	-.049
% Manu in Earnings, 1969	**-.080**	**-.057**
% Ret Trade in Earnings, 1969	.024	.098
% FedGovCiv in Earnings, 1969	-.032	-.042
% FedMil in Earnings, 1969	-.260	-.164
% St/Local in Earnings, 1969	-.009	.071
Population Growth Rate, 1950-1960	**.068**	**.062**
Interstate	-.740	-.220
NewPerMileLandArea00	**14.783**	**9.148**
ReplacePerMileLandArea00	-5.474	-1.394
WidenPerMileLandArea00	-.832	8.422

3.4 Uses and Limitations of the Findings

Whereas the prior study examined Appalachian economic growth over the 1965-1991 period, this new study updates it to the year 2000. It confirms the general findings of the prior study that ARC is making a difference. The ARC counties are now outperforming comparable non-Appalachian counties in terms of income and earnings growth. It also confirms a general finding that economic performance is weaker and more problematic in the rural and micropolitan counties than in the larger metro counties.

However, this new expanded analysis adds information not previously available. This research effort included development of a large base of data on Appalachian Development Highway system mileage, lanes, and construction years, by county. Using this more detailed dataset, the new study found statistically significant evidence

that the completion and presence of an ADHS segment in a county does lead to greater economic growth. It found that "lane miles of new highway construction" (mostly built prior to 1990) is a significant predictor of income and earnings growth occurring later during the 1990s but not in earlier years. This indicates that the economic development impact of new highways can take many years to unfold. It also supports the finding that business sector response to highway improvements can be slower than the residential sector response. The study also found that "new construction," but not "replacement" or "widening," led to a notable impact on economic growth.

Beyond the highway impact, the study of long-term trends also showed that the states performing best relative to their non-Appalachian "twins" (i.e., Georgia, Kentucky, South Carolina, and Tennessee) appeared to do so in part on the strength of their performances in manufacturing. This reinforces the finding that manufacturing clusters are still an important source of economic growth.

This research effort shows the importance of continual updating and analysis of economic trends in Appalachian counties, as economic growth patterns continue to evolve in new ways. It also shows the need for further study to better untangle: (a) interactions of ADHS and interstate highway system improvements, (b) differential impacts of highway expansion and new construction, and (c) impacts on per capita income vs. growth of aggregate income and earning power (which also reflects population changes).

3.5 Survey Instrument

The following three pages contain the survey letter and form. The survey was filled out by each of the thirteen state transportation departments, and provided information on Appalachian Development Highway sections in each state, including dates of construction of various highway sections, information on mileage, lanes, intersections, interchanges and traffic counts.

APPALACHIAN REGIONAL COMMISSION

A Proud Past, A New Vision

April 27, 2005

Mr. William Adams, P.E.
Location Engineer
Alabama Department of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36110-3050

Dear Mr. Adams:

Staff of the Appalachian Regional Commission (ARC) and our consultants, Economic Development Research Group (EDRG), are conducting a study to measure economic development benefits of Appalachian Development Highways. The ARC is working to develop an updated historical inventory of prior projects for this study and for future use in demonstrating impacts of these projects.

We need help from each state to accomplish these goals. We ask that your agency help us to complete information shown on the next page, summarizing information on Appalachian Development Highway sections in your state, including dates of construction of various highway sections, information on intersections and interchanges and traffic count data. The enclosed packet includes an information collection form, a set of instructions, and a sample completed form. The information collection form lists each county in your state that has been identified as having at least one Appalachian Development Highway section. If you believe that this list contains any errors, please note it on the form or contact us directly.

If you have any questions about this project, please feel free to call Greg Bischak of the Appalachian Regional Commission at (202) 884-7790. If you have any questions about how to complete this form, please contact Teresa Lynch of EDRG at (617) 338-6775, ext. 207. Completed forms can be returned by email to tlynch@edrgroup.com or by postal mail to EDRG, 2 Oliver St, 9th Floor, Boston MA 02114, attn: ADHS survey.

Thank you for your assistance.

Sincerely,

Kenneth Wester
ADHS Program Coordinator

1666 CONNECTICUT AVENUE, NW, SUITE 700 WASHINGTON, DC 20009-1068 (202) 884-7700 FAX (202) 884-7691

INFORMATION COLLECTION FORM
FOR DATABASE ON ADHS SEGMENTS

A. HIGHWAY SUMMARY

State:	*Alabama*
Appalachian Corridor:	*V, X*
US/State Highway #s:	*See attached map*

Counties Served (list):	Franklin	Marion	
	Jackson	Morgan	
	Jefferson	St. Clair	
	Lawrence	Walker	
	Limestone		
	Madison		

B. FORM COMPLETION

Name of person completing the form:		Telephone number:	
E-mail address:		Date of completion of the form:	

Instructions:

The next page contains a form that asks for information about the characteristics of Appalachian highway sections within each county. The characteristics are: year construction started; year highway section was opened to traffic; highway width (number of lanes) before and after construction; type of highway improvement (brand new ("NEW"); widening of existing highway ("WIDEN"); or replacement of existing highway, which is then retired ("REPLACE")); and number of interchanges and signalized intersections. For interchanges and signalized intersections, the actual number should be entered; however, if the number is greater than 10, you may enter "10+". In cases where different highway sections within a county have different dates of construction or opening dates, information should be provided for each section separately. You might also wish to report multiple sections within each county if different parts of the highway have different roadway characteristics and/or different traffic levels.

In addition, we would like available traffic counts (average daily traffic totals, 2-way) for section of the highway route, ideally covering periods before completion, shortly after completion and most recently available. You may enter the traffic counts and other information on this form or use your own sheets. Please note the location of the counts if they apply only to a particular part of a highway section.

To aid in completion of this form, we have included a sample completed form and where available, maps that show segments alignments and route numbers.

C. HIGHWAY CHARACTERISTICS

County Name	Section Description, if necessary	Date Construction Started	Date Open to Traffic	Type of Improve-ment	Section Length (miles)	#Hwy Lanes (Before /After)*	Access Type*	# Signalized Intersections	# Limited Access Inter-changes	Traffic Counts (ADT & year)
Franklin										
Jackson										
Jefferson										
Lawrence										
Limestone										
Madison										
Marion										
Morgan										
St. Clair										
Walker										

** Highway Lanes: 2, 4, 6 or 2/4M=mixed 2 and 4; Access Type: L =Limited Access, O = Open Access, M = Mix of Open and Limited*

4 POPULATION BASE & ACCESS TO AIRPORTS

"Spatial Geography: Effects of Population Base and Airport Access"
by
Teresa Lynch, Tyler Comings and Glen Weisbrod
Economic Development Research Group

4.1 Introduction

This chapter describes findings from two related studies. One examines the impact of a county's population base on its business mix. The other examines how highway access to airports also affects business mix. These two studies differ from other studies discussed in this report in that they focus on identifying determinants of a county's business mix rather than its economic growth and well-being.

The motivation is to help identify the conditions necessary for pursuing growth paths that target various types of manufacturing, trade, services or other business sectors. In addition, these two research studies are intended to shed additional light on the role and importance of highway access in supporting economic growth.

A major element of both research studies is that they focus on examining the existence of "threshold" or other non-linear effects. In other words, it would be expected that some types of business require a minimum labor market or customer market in order to select a location for a new plant. Similarly, some types of business may require locations within a particular travel time to an airport, which must also be of a minimum size to provide sufficient scheduled service. Thus, the role of thresholds and non-linear responses becomes important.

4.2 (A) Population Base: Methodology

Measure of Business Mix. The first part of this study examines the relationship of a county's business concentration and mix to its scale of population base or market. This relationship can be particularly important in establishing how the viability of various growth strategies and target industries may differ depending on the county population base or the degree to which it is urban or rural.

For this study a dataset was used that provided year 2002 employment by 3-digit NAICS industry codes, for each of the 410 counties in the ARC region. A dataset prepared by IMPLAN was used because it provided measures of total employment including self-employed individuals and farm workers, who are not covered in County Business Patterns data. IMPLAN data are based predominantly on the REIS data, but has the advantage that it has values filled in for all industries in all counties, without the problem of missing (withheld) data which is common for many specific industries in small rural counties. Using this dataset, we define and calculate an indicator of relative business concentration:

Business Concentration (i,c) = Employment Share (i,c) * Attraction Ratio (i,c)

where:

Employment Share = Employment (i,c) / Employment (Σ i, c)

Attraction Ratio = Employment (Σ i, c) / Population (c)

and i = NAICS industry, Σ i = sum over all industries, c=county

which simplifies down to:

Business Concentration (i,c) = Employment (i,c) / Population (c)

The reason for constructing this composite measure of relative business concentration is to represent the combination of relative industry mix (represented by the Employment Share calculation) and relative industry attraction (represented by the Attraction Quotient). The Employment Share calculation is the numerator of the Location Quotient used in an earlier chapter to measure the economic base analysis of trade areas. However, instead of using the denominator of the Location Quotient (which represents national norms for industry mix), we make use of an Attraction Ratio which expresses industry employment per local population base.

The Attraction Ratio can reflect the extent to which a county has a greater level of employment in the given industry than would be expected given its population. A high ratio is generally interpreted as an indicator that the county is a business center for the given industry and has a net inflow of workers coming in from surrounding areas for that industry. On the converse side, a low Attraction Coefficient could would normally be interpreted as an indicator that the county is not a center of activity for that industry, though that may be due to many factors including a high a unemployment rate or a low labor force participation rate (e.g., a retirement area).

This per capita measure of business concentration nets out the effect of differences in county population size, so that a small county can in theory have a high concentration of a given industry just as easily as a large or populous county. By normalizing the business concentration in this way, we make it possible to analyze the role of population size in affecting the business concentration, while avoiding correlation between the two.

Alternative Travel-Time Based Definition of Population Base. An alternative definition of population base was also constructed in which we used ESRI's Geographic Information System to calculate the population base within a 30 or 40-minute drive time of the population-weighted center of each county. That concept utilizes a more sophisticated form of spatial analysis than simply measuring the population located within each county.

Unfortunately, preliminary analysis showed that this new measure actually had *less* power in predicting business concentration. The reason was that defining a county's trade area in this way fails to provide any leverage for distinguishing between (1) a county that is the center of activity in a multi-county region and (2) a fringe county that exports its workers and spending to the center of activity. In both cases, the 30 or 40-minute drive time from each county would include the others, so that they would all appear to have an equally large trade area. The simpler metric of total county population, it is actually more accurate in distinguishing counties that are a center of population and activity from those that are more rural and serve as feeders to the activity centers.

Modeling the effect of county population size. The analysis examines how the business concentration indicator for each industry differs by population level of the county (based on Year 2000 Census data). Two different techniques are used: (1) exploration of alternative regression functional forms, and (2) exploration of differences in the ratio among county population size groups.

The a priori assumption was that the ratio of employment over population for retail industries will stay generally constant as population increases. For specialized distribution and services industries, though, it would be expected that the ratio should increase with greater population base, as these industries are more sensitive to market size features. We would also expect those industries that thrive in rural areas—agriculture and mining—to be negatively affected by increases in population density.

The first technique involved using "curve estimation" to explore the relative significance and explanatory power of alternative functional forms for each industry. The slope of this regression at any given point will be the ratio of Business Concentration to population. Therefore, if a *linear model* fits the data best, then we can conclude that the Business Concentration changes directly as population increases. If a *quadratic model* is the best fit (wherein the sign of the coefficient of the quadratic term, $[\text{population}]^2$, is positive) then the Business Concentration grows faster as population increases; if the sign is negative then the ratio growth will slow down as population increases. Similarly, if the best fit is a *logarithmic model* than the Business Concentration growth will also slow down and stop growing as population increases. These sets of models were run separately for 52 industries. In addition, an analysis of *threshold effects* was conducted by breaking down this relationship by six distinct size classes.

4.3 (B) Population Base: Results

Regression Results. The results of these regressions are close to *a priori* expectations. Retail industries have linear and quadratic regressions that fit very closely. Service industries have mostly positive quadratic coefficients. Agricultural industries exhibit a logarithmic or quadratic (with a negative sign) relationship. The latter is not surprising since agricultural industries usually thrive in rural areas. Manufacturing industries exhibit results that are generally mixed and insignificant, indicating that they are less sensitive to scale of the population base than retails and service businesses.

The regressions results are shown in Exhibit 4-1 for those industries in which the model had statistically significant coefficients and an R^2 of 0.50 or better (indicating that the regression formula was explaining over 50% of the variance in the industry concentration measure.) Key findings are that:

- The business sectors with a *negative quadratic coefficient* have an aversion to counties with a larger population base. These are generally agricultural sectors.

- The business sectors with a *positive quadratic coefficient* show increasing growth of business concentration as population grows, though the point of inflection differs among industries. These are generally wholesale and retail trade sectors that have some market scale requirements.

- The business sectors that had a *logarithmic regression* fit best are those that have some minimum population size requirement but no additional growth in business concentration as population increases further. These are industries that process crops and livestock, and hence need access to a minimal labor force

- About half of all industries are *not listed* because there did not appear to be a statistically significant relationship between their concentration and county population in the regressions. They include mining, most manufacturing and freight transportation. For these industries, factors including the location of natural resources, topography and access to highway networks may be more important than just having a local population base. (Note that the role of access to highways is explored in the prior chapter, and highway access to airports is explored in a later part of this chapter.)

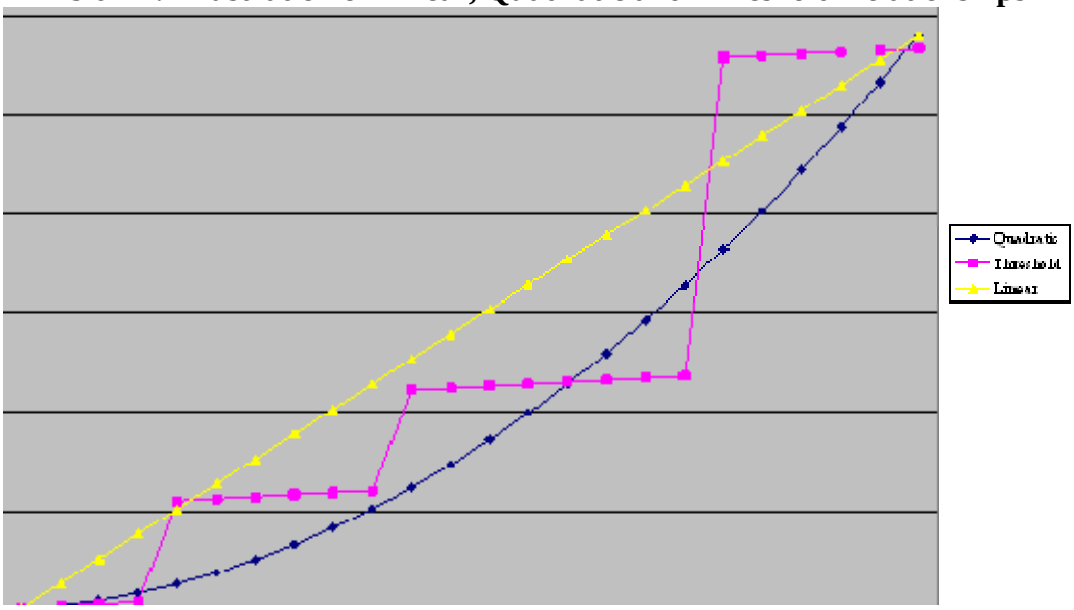
Exhibit 4-1 Business Concentration Regression Results for Selected Industries

NAICS		Parameter Estimates		
		B1(Pop)*	B2(Pop^2)**	R^2
Quadratic w/ negative coefficient				
332	Fabricated metal prod	7933.4	-2200.	.66
447	Gasoline stations	5080.97	-2500.	.90
623	Nursing & residential care	12041.88	-6900.	.86
721	Accommodations	3313.56	-880.	.50
Quadratic w/ positive coefficient				
42	Wholesale Trade	7520.11	58500.	.91
92	Government & non NAICs	59961.5	34200.	.85
221	Utilities	1392.93	4150.	.53
230	Construction	25623.49	49400.	.94
323	Printing & Related	2268.82	2300.	.58
339	Miscellaneous mfg	1812.84	3560.	.63
441	Motor veh & parts dealers	7309.62	6050.	.96
442	Furniture & home furnishings	1459.61	2840.	.88
443	Electronics & appliances stores	1000.83	3450.	.87
444	Bldg materials & garden dealers	4180.55	4590.	.90
445	food & beverage stores	10155.42	5390.	.95
446	Health & personal care stores	3392.82	3140.	.95
448	Clothing & accessories stores	3156.62	9680.	.79
451	Sports- hobby- book & music stores	1819.98	4920.	.88
452	General merch stores	11004.37	4340.	.94
453	Misc retailers	4435.05	7810.	.91
454	Non-store retailers	4136.71	6150.	.62
484	Truck transportation	9186.41	2990.	.50
491	Postal service	1642.57	3830.	.79
492	Couriers & messengers	1371.51	3310.	.63
493	Warehousing & storage	1431.7	2030.	.63
511	Publishing industries	1523.2	4640.	.83
512	Motion picture & sound recording	278.92	1630.	.72
513	Broadcasting	539.11	21100.	.89
514	Internet & data process svcs	-97.03	4630.	.64
521	Monetary authorities	3367.09	13000.	.79
523	Securities & other financial	497.98	9000.	.77
524	Insurance carriers & related	907.77	35400.	.79
525	Funds- trusts & other finan	-340.7	2870.	,54
531	Real estate	6331.76	17000.	.85
532	Rental & leasing svcs	1857.06	5280.	.92
541	Professional- scientific & tech svcs	13221.38	67400.	.78
551	Management of companies	1378.15	11600.	.77
561	Admin support svcs	13487.54	67000.	.89
621	Ambulatory health care	16961.05	12000.	.89
622	Hospitals	12300.35	9430.	.67
711	Performing arts & spectator sports	1744.07	5000.	.90
713	Amusement- gambling & recreation	4060.41	1730.	.77
722	Food svcs & drinking places	32363.29	20600.	.95
811	Repair & maintenance	9138.55	15100.	.94
812	Personal & laundry svcs	4926.94	8330.	.90
Logarithmic				
111	Crop Farming	27.909197	--	.55
112	Livestock	36.6938123	--	.64

The independent variable is POP.
*actual coefficients multiplied by 1,000,000
**actual coefficients multiplied by 1,000,000,000,000

Concept of Thresholds. The strong finding that retail and service industries had non-linear relationships between industry concentration and population base indicates the likely presence of "threshold effects"—where a certain minimum population base is necessary to make a given industry viable and thus attracted to the area. Of course, the location and magnitude of this threshold effect may differ by industries. Exhibit 4-2 portrays this relationship by contrasting a linear relationship, a quadratic relationship and a threshold relationship (where multiple thresholds are shown).

Exhibit 4-2. Illustration of Linear, Quadratic and Threshold Relationships



It would be expected that threshold effects are particularly important for specialized business functions such as professional and financial services. That is, we expect the size of an area affects its ability to attract certain (generally high-skilled) sectors, either because these sectors require large numbers of potential customers or require specialized skills that are more easily found in larger labor markets.

To test this hypothesis, we calculated business concentration ratio for each 3-digit NAICS sector for the following county population sizes: <10,000, 10,000-24,999, 25,000-49,999, 50,000-99,999, 100,000-249,999, and >250,000. As shown in Exhibit 4-3, the industries that exhibit threshold effects can be categorized into two groups. In Group 1, Business Concentration (sector employment per capita) successively increases with county size, indicating that there may be increasing returns to increasing population base, and possibly also some threshold effects. In the Group 2, Business Concentration declines between county population size <10,000 and county population size 10,000-25,000, then increases with each increase in county population. This second group of industries may indicate that there are minimum requirements or scale effects at work that preclude those industries from locating in rural areas with a small population base.

Exhibit 4-3. Evaluation of Threshold Effects

% change in Business Concentration Ratio(Jobs-per-capita) from Previous (Smaller) Population Category

NAICS - Industry Sector		ARC County population					
		10,000-24,999	25,000-49,999	50,000-99,999	100,000-249,999	over 250,000	*TOTAL Growth*
Group 1: Positive growth across all size categories							
42	Wholesale Trade	85%	36%	38%	24%	71%	*640%*
230	Construction	26%	7%	22%	22%	27%	*153%*
441	Motor vehicle/parts dealers	54%	30%	28%	8%	5%	*190%*
442	Furniture stores	67%	35%	11%	38%	29%	*345%*
443	Electronic & appl. stores	117%	23%	35%	61%	76%	*919%*
445	food & beverage stores	21%	10%	5%	17%	4%	*70%*
446	Health & pers care stores	15%	10%	10%	14%	10%	*74%*
448	Clothing stores	77%	40%	39%	43%	56%	*670%*
451	Specialty stores	48%	30%	65%	59%	60%	*709%*
454	Non-store retailers	73%	9%	11%	9%	17%	*166%*
481	Air transportation	14%	48%	208%	223%	270%	*6108%*
485	Transit & ground passengers	88%	155%	2%	29%	18%	*647%*
511	Publishing industries	17%	9%	43%	47%	152%	*574%*
523	Securities & other financial	31%	12%	54%	125%	317%	*2031%*
524	Insurance carriers & related	19%	13%	67%	61%	139%	*767%*
541	Professional & tech. services	11%	52%	64%	31%	157%	*829%*
561	Admin support services	82%	51%	41%	36%	88%	*891%*
621	Ambulatory health care	26%	21%	23%	24%	29%	*204%*
622	Hospitals	73%	2%	33%	12%	17%	*208%*
722	Eating & drinking places	16%	36%	23%	15%	19%	*166%*
811	Repair & maintenance	40%	34%	31%	14%	30%	*265%*
812	Personal & laundry services	0%	48%	31%	27%	44%	*254%*
Group 2: Sectors with *Jobs-per-capita* growth at population levels of 25,000+							
92	Government etc.	-10%	11%	19%	15%	20%	*63%*
453	Misc retailers	-2%	16%	38%	20%	29%	*145%*
487	Sightseeing transportation	-50%	88%	31%	9%	122%	*195%*
514	Internet & data process svcs	-70%	17%	104%	208%	79%	*296%*
531	Real estate	-22%	40%	20%	41%	122%	*314%*
532	Rental & leasing svcs	-45%	39%	19%	12%	84%	*87%*
562	Waste mgmt & remediation	-3%	62%	1%	0%	28%	*102%*
711	Performing arts & sports	-62%	9%	15%	72%	113%	*76%*

The results in prior Exhibit 4-3 show that the Business Concentration Ratio in various both retail and specialized services is much higher in larger counties than in smaller counties. This may also reflect the growth of big box retailers that invest primarily in areas with some minimum population size threshold. It is particularly interesting to note some of the most dramatic threshold jumps:

- Growth in Transportation (NAICS 481) above 50,000 population,
- Growth in Financial Securities (NAICS 523) above 100,000 population,
- Growth in Publishing (NAICS 511) above 250,000 population,
- Growth in both Professional-Technical-Scientific Services (NAICS 541) as well as Insurance Offices (NAICS 524) above 250,000 population,
- Presence of Real Estate (NAICS 531) and Sightseeing Transportation (NAICS 487) starting at 25,000 population with an additional jump above 250,000

The various types of threshold relationships are shown graphically in Exhibits 4-4 through 4-6. Exhibit 4-4 illustrates the jump in professional and scientific services when the population exceeds 250,000. This finding makes sense as this kind of industry usually is found in very large population centers. This industry's functional form was quadratic with a positive coefficient which indicated that relative activity in this industry increased with population.

Exhibit 4-4. Threshold for Professional, Technical and Scientific Services

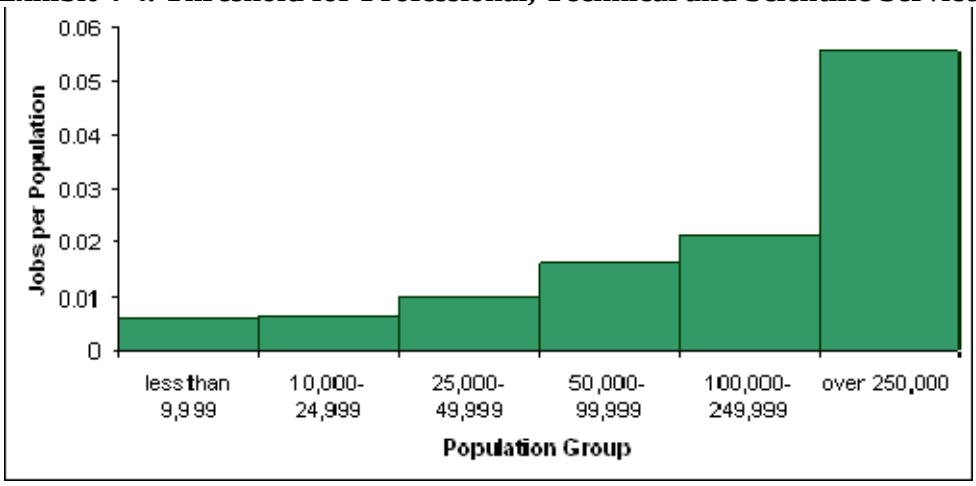


Exhibit 4-5 illustrates a pattern of continuing growth in business concentration as population increases. The functional form of the regression for this industry was quadratic with a negative coefficient which suggests that the rate of growth in activity peaks and then eventually tapers off as county population increases further.

Exhibit 4-5. Threshold for Ground Transportation

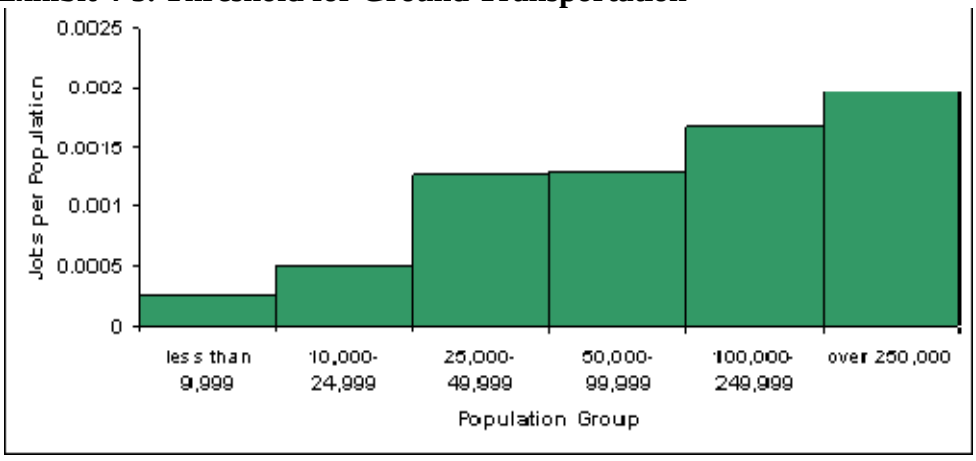
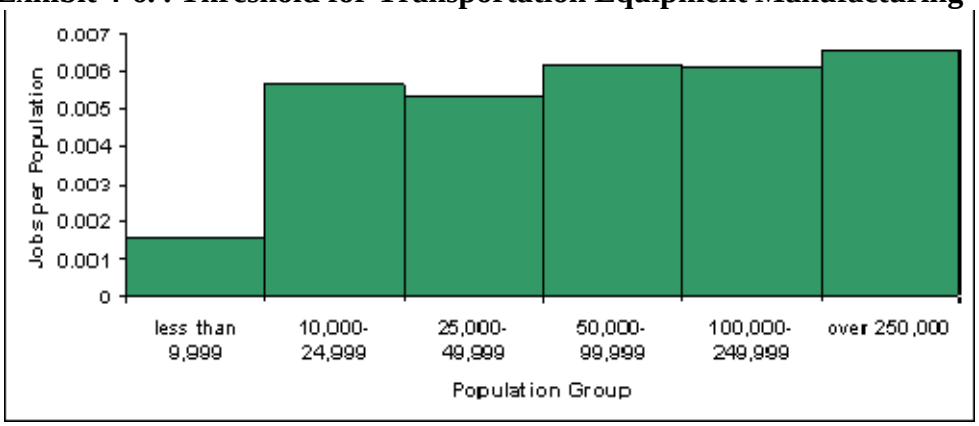


Exhibit 4-6 shows an example of the relationship for many manufacturing industries, which may require a minimum of around 10,000 population but do not appear to grow in Business Concentration as area population increases further. As previously noted, this type of business is often dispersed along supply chains and depends on transportation network connections rather than population size as a locational determinant. In fact, one of the motivations of a dispersed supply chain is that it allows use of parts suppliers located in lower cost and smaller labor markets.

Exhibit 4-6. . Threshold for Transportation Equipment Manufacturing



When comparing the regression results to the category-based threshold analysis, it was concluded that the latter form of analysis provided more precision. The regressions do give an indication of the type of relationship that employment-per-capita has for a given industry. However, they do not allow for precise identification of inflection points in a relationship that are due to minimum requirements for market or production scale economies. Further discussion of the use and limitations of this analysis, and directions for further research, are presented at the end of this chapter.

4.4 (B) Airport Access: Methodology

The second part of this study examines the relationship of a county's business mix to airport proximity, where both highway drive time to the airport and the size of airport service are considered. For some manufacturing industries that have national and international customers, airport access can be particularly important.

This analysis starts with the same dataset as the prior study of business concentration. It uses year 2002 employment by 3-digit NAICS industry codes, for each of the 410 counties in the ARC region. It was supplemented by comparable data for another 228 counties located outside of the ARC region, to enhance the coverage of outside metro centers. This data from IMPLAN represents total employment including self-employed individuals and farm workers, who are not covered in County Business Patterns. The study also used a Geographic Information System to calculate each county's population-weighted centroid, and the average drive time (in minutes) from that location to the closest airport with scheduled passenger service. Additional FAA data was used to represent the level of airport activity, represented as the number of commercial airline takeoffs and landings (known in the aviation field as "total operations").

It would be expected that industries that are more dependent on air transportation will seek locations convenient to an airport, and particularly locations convenient to an airport that is large enough to serve their needs. This may include businesses that rely on air service for incoming materials, customer visits, employee sales travel, or product delivery. In general, business sectors that are known to value air transportation include light manufacturing industries that rely on exporting and importing air cargo, and service industries that rely on employee business travel.

To estimate this relationship, each industry's share of total county-wide employment was calculated, and non-linear regression analysis was used to predict the roles of explanatory variables representing airport access time, airport size and the interaction of the two. There are several salient considerations that guided this specification:

- The measure of Employment Share was used to represent the relative portion of countywide employment each industry. This measure was used in order to focus on how airport access affects the *economic specialization* of counties. This measure was used instead of employment size or business concentration measures to avoid correlation with population size of the county, which is another factor analyzed separately in the preceding part of this chapter.

- The analysis of explanatory factors focused on interactions between airport size and airport distance or travel time in order to illuminate the role of highway connections in improving access for air-dependent industries.

- Various forms of "curve fitting" regression formulations were used to calculate the relationships and shape of curves. But unlike the preceding study of population base, there was no separate analysis of threshold effects for airport distance because many types of business value airport proximity but few if any would find additional value in being some minimum distance away.

The statistical analysis tested various linear, quadratic and logarithmic curve forms to explain the roles of airport size and ground access travel time on industry employment shares. They all generally involved three explanatory variables: size of airport(number of operations), distance to airport (access time), and the interaction between the two (number of operations*access time). The functional form for the linear model was:

$$\textit{Employment Share } (i,c) = B_1 * \textit{time}(c) + B_2 * \textit{Size}(c) + B_3 * [\textit{time}(c) * \textit{size}(c)$$

where i = NAICS industry and c=county

The statistical analysis also tested a "gravity model" formulation that represented the interaction between a positive weighting factor of airport size and a negative factor of airport access time (squared).

$$\textit{Employment Share } (i,c) = B_1 * \textit{time}(c) \;/\; \textit{size}^2(c)$$

4.5 (B) Airport Access: Results

Roles of Airport Access Time and Size. Results of the regressions can best be illustrated by showing how various industries respond differently to the effect of airport access time (holding airport size constant), and to the effect of airport size (holding airport access time constant). Accordingly, we present a pair of graphics for a typical county.

Exhibit 4-7 illustrates how the predicted number of jobs in a typical county would differ as *ground access time* to a typical size airport increases. It shows a steep drop-off of jobs in professional and technical services as airport access time increases from 1 to 80 minutes, with lesser impact beyond that point. The role of access time is significant but less dramatic for transportation equipment manufacturing and essentially non-existent for logging industries (which seldom use air travel).

Exhibit 4-8 illustrates how the predicted number of jobs would differ as *airport scale* (annual operations) increases. It shows a steep rise of jobs in professional and technical services as airport size rises above 50,000 annual commercial operations, tapering off as annual commercial operations increase beyond 100,000. The role of airport scale is significant but less dramatic for transportation equipment manufacturing (increasing most steeply as annual commercial operations rise to at least 10,000). Again, the role of airport size is essentially non-existent for logging

industries (which seldom use air travel).

Exhibit 4-7. Effect of Ground Access Time to Airport

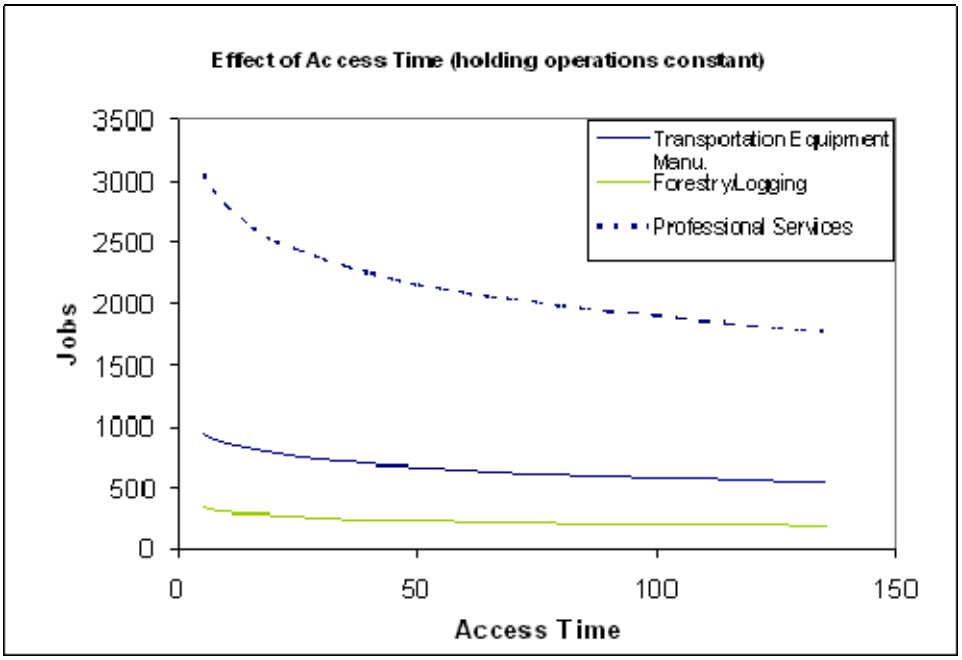
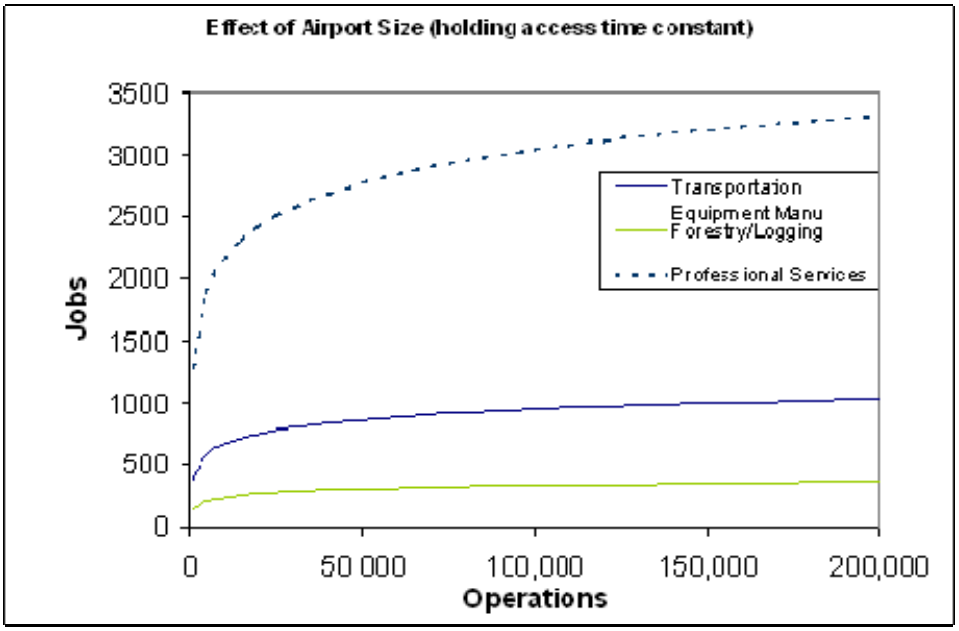


Exhibit 4-8. Effect of Airport Size



The regression coefficient estimates, shown in Exhibits 4-9 and 4-10, also show how some industries have a negative (or positive, diminishing) reaction to airport access and size. For instance, in Exhibit 4-9 the effects in agricultural industries have a positive coefficient for *time*. This means that they benefit from being further away from an airport. Other industries that have a significant positive coefficient for time include: mining, apparel manufacturing, and furniture manufacturing.

Some of those industries in Exhibit 4-9 that have a negative, significant coefficient for time (indicating that they value a reduction in airport travel time) are: wholesale trade, paper manufacturing, insurance, and professional services. These are the types of industries that we would expect to situate near airports, since they all rely on worker air travel for meetings with either clients or other office locations of their business. Exhibit 4-10 shows industries that have a positive but diminishing effect as airport access time decreases or operations increase. Some of these industries showed a negative effect in Exhibit 4-9 (i.e. crop production); this is due to the use of a different functional form. The estimates obtained for Exhibit 4-10 used a logarithmic model which gave many significant parameters estimates yet was not the best fit across all industries.

Testing of Urbanization Effect. We might expect these coefficients to also be affected by the degree of urbanization of a county. While the measure of Employment Share is standardized so that it is not affected directly by population size, it is known that some technology and service industries congregate in high population areas, as demonstrated in the preceding Population Base analysis. To see if this has an effect on the airport analysis, we tested whether the core model coefficients changed sign or significance when adding the "*urban effect."* This effect was incorporated by adding a dummy variable for counties with population of 200,000 or more (Urban dummy = 1). All other counties were assigned a value of 0" representing non-urban areas.

The implications of adding a test of urbanization to Model #1 are embedded in Exhibit 4-9. The urban effect is categorized in the columns to the right of each independent variable: (A) represents cases where the urban dummy variable stays significant and has the same sign as the original variable, (B) represents cases where the original variable is insignificant but the urban variable is significant, and (C) represents cases where there is no significant urban effect; i.e., where the urban variable is not significant even though the original variable was significant.

The results show most of the effects lie in the "C" category. For the time variable, there is either no urban effect or adding the urban variable only makes the time variable insignificant—the exception being the wood products industry. For the size and interaction variables, there are several industries where the effect of these variables is reinforced in urban counties. These industries include: insurance, real estate, professional services, administrative services, and publishing. However, for most industries there seems to be no urban effect.

Exhibit 4-9. Regression Results for Airport Access Model #1
(shown for selected industries with statistically significant coefficients)

Sector		B_1(Time)		B_2(Size)		B_3(Time*Size)	
111	Crop Production	**181.38**	C	**-2981**	C	23.731	-
112	Animal Production	**210.41**	C	**-5443**	C	**69.797**	C
113	Forestry & Logging	**68.704**	C	-317.7	-	-2.519	-
115	Support for Agriculture & Forestry	-25.778	-	**-1649**	C	**34.547**	C
212-213	Mining & Support Activities	**281.68**	-	886.9	-	-25	-
230	Construction	-53.341	-	**3171.5**	C	-4.689	-
313	Textile Mills	1.162	-	-1654	-	**24.611**	C
315	Apparel Manufacturing	**60.604**	-	-959.2	-	11.457	-
321	Wood Products	120.15	B	**-1509**	-	10.069	-
322	Paper Manufacturing	**-38.529**	C	-601.9	-	4.229	-
324	Petroleum & Coal Products	**-6.944**	C	-45.09	-	0.262	-
325	Chemical Manufacturing	**-44.866**	C	-577.6	-	3.71	-
336	Transportation Equipment	-1.818	-	**-1558**	-	16.915	-
337	Furniture & Related Products	**104.76**	-	-929.2	-	8.37	-
420	Wholesale Trade	**-85.13**	C	**3051.8**	C	**-32.57**	C
441-454	Retail Trade	-53.926	-	-348.1	-	0.209	-
491-493	Mail, package delivery & warehousing	**-51.904**	C	636.49	-	-8.7	-
511	Publishing Industries (except Internet)	-7.676	-	**595.39**	A	**-7.997**	A
512	Motion Picture & Sound Recording	**-4.165**	C	**248.7**	C	**-2.874**	C
513	Broadcasting	-1.182	-	**1345.2**	C	**-18.366**	C
514	Internet & data process svcs	-3.325	-	**595.67**	C	**-8.048**	C
524	Insurance Carriers & Related Activities	**-39.451**	C	**1145.7**	A	**-15.307**	A
525	Funds, Trusts, & Financial	1.755	-	**335.42**	A	**-4.53**	C
531	Real Estate	-28.396	-	**2846.1**	A	**-31.769**	A
532	Rental & Leasing Services	4.199	-	**449.11**	A	**-6.451**	C
541-551	Prof. Scientific, Technical, Services	**-176.12**	C	**7735.9**	A	**-93.673**	A
561	Administrative & Support Services	**-147.74**	C	**4584**	A	**-46.247**	A
711-713	Amusement & Recreation	**-49.522**	C	**1569.8**	C	**-17.369**	C
721-722	Accommodations, Eating & Drinking	**-124.69**	C	**1887.8**	C	-18.107	-
811-812	Repair, Maint, Personal Services	**-84.957**	C	**1428.1**	C	**-11.626**	C
814	Government	58.482	-	**-2413**	-	**37.496**	C

bold *indicates that coefficient is statistically significant*
A*=urban variable reinforces effect*
B*=only an urban effect*
C*=no urban effect when variable is already significant*
"-"=no significant effect in either case or incorrect sign

Exhibit 4-10. Regression Results for Airport Access Model #2
(shown for selected industries with statistically significant coefficients)

NAICS	Industry	Parameter Estimates b1(ln(oper/time))
111	Crop Production	**0.003992**
112	Animal Production	**0.004882**
113	Forestry & Logging	**0.00068**
115	Support for Agriculture & Forestry	**0.000756**
212-213	Mining & Support Activities	**0.001431**
230	Construction	**0.010472**
313	Textile Mills	**0.001388**
315	Apparel Manufacturing	**0.001057**
321	Wood Products	**0.001964**
322	Paper Manufacturing	**0.000789**
325	Chemical Manufacturing	**0.00091**
336	Transportation Equipment	**0.001901**
337	Furniture & Related Products	**0.001897**
420	Wholesale Trade	**0.004073**
441-454	Retail Trade	0.018785
491-493	Mail, package delivery & warehousing	**0.001503**
511	Publishing Industries (except Internet)	**0.000559**
512	Motion Picture & Sound Recording	**0.000142**
513	Broadcasting	**0.001072**
514	Internet & data process svcs	**0.000224**
524	Insurance Carriers & Related Activities	**0.001345**
531	Real Estate	**0.00256**
532	Rental & Leasing Services	**0.000731**
541-551	Professional Scientific, Technical, Services	**0.006102**
561	Administrative & Support Services	**0.004967**
711-713	Amusement & Recreation	**0.002314**
721-722	Accommodations, Eating & Drinking	**0.010516**
814	Government & non NAICs	**0.00226**

*Note: **bold** coefficients are statistically significant*

4.6 Uses and Limitations of the Findings

The findings shown in this chapter can be directly embedded in the Local Economic Assessment Package which ARC provides to its Local Development Districts. The findings on threshold effects associated with local population base can be used to identify likelihood of attracting various industries to a local area. The findings on the role of access time and facility service level factors on business attraction can be incorporated in the diagnosis of barriers associated with insufficient access to airport services. At the time of this publication, these improvements have already been made to the LEAP model.

There are, however, clear ways in which this line of analysis can be improved. There is a need to explore whether or not a measure of trade center strength, such as the spatial multiplier used in the Chapter 2 study, may be as good or better than the current population base as a predictor of market area strength for attracting retail, wholesale and related service businesses. There is also need for further analysis of the business attraction relationship to airport access – separating improvements in access time, distance, type of highway access and/or airport service levels. Finally, there is a need to further explore the ways in which the impacts of market scale and airport access features may be better measured in terms of industry employment shares, concentration ratios or total size of the industries.

5 SPATIAL INFLUENCES IN COUNTY ECONOMIC PERFORMANCE

This chapter is extracted and edited from the original document:
"Task 1, Part 4: Empirical Analysis""
by
Prof. Joseph Ferreira, Jr., Ayman Ismail and Zhijun Tan,
Massachusetts Institute of Technology

5.1 Introduction

To better understanding what causes some non-metro Appalachian counties to make economic strides forward, while others remain distressed, a set of empirical studies were conducted with the aim of elucidating the role exerted by economic areas linked to a county. Our objective here is to (a) identify the nature of that linkages among counties, (b) define the geographic extent and features (contiguous/ non-contiguous) of this spatial neighborhood, (c) assess the roles of mountain topography, market access and highway links in affecting those results, and (d) identify how these factors affect levels of economic distress and changes in those levels over time.

In this section, we present an exploratory analysis of the factors affecting the current economic conditions and trends in Appalachia's non-metropolitan (non-metro) counties. We extract four types of variables that we consider to be closely related to the USDA/ERS typology of Appalachian Region counties, because regional analysts generally consider county type to play a significant role in determining county economic performance. We explore the statistical features and spatial patterns of the variables using statistical software and mapping and spatial analysis tools available in ArcGIS, geographic information systems, SPSS statistical analysis software and GeoDa, spatial statistics software developed by the Spatial Analysis Laboratory (SAL) in the Geography Department at the University of Illinois, Urbana-Champaign.

5.2 Exploratory Statistical Analysis

The analysis conducted for this study focused on the development of various forms of regression models to assess the role of explanatory factors in explaining and predicting patterns and trends in the economic well-being of non-metro Appalachian counties. Specifically, the types of county data that we use include:

Dependent variables:

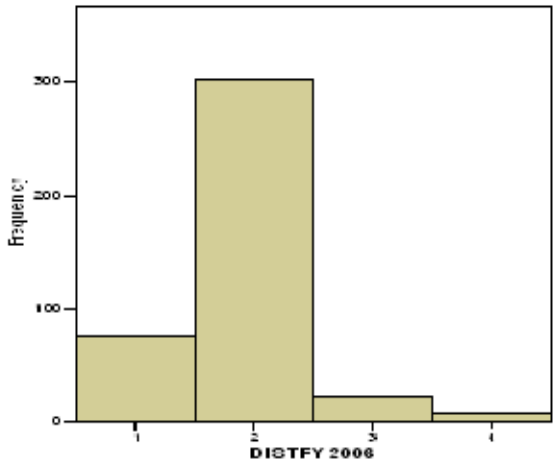
- ***Measures of economic health***: As a dependent variable, to be explained through the empirical analysis, we examine several measures (current levels or growth change) of each county's economic health. One key measure is the ARC county economic-status classification, whereby counties are classified a "attainment," "competitive," "transitional," or "'distressed" for each (fiscal) year. This classification is based on employment, income, and poverty measures (relative to the US average). The "Pickard Index" combines the three measures into a single, continuous index of economic level. In order to distinguish these two variables, we name the four-level, categorical variable as the ARC county Economic Status Class (ESC), and the continuous variable (the Pickard Index) as the county Economic Level Index (ELI). Another measure of economic health that we utilize is the county employment *growth* between 1990 and 2000, adjusted (using shift-share analysis) to control for national trends. This measure is obtained from IMPLAN based on Bureau of Economic Analysis and their Regional Economic Information System.
- ***Change in economic health:*** We assess patterns of change over time in terms of (a) the rate of growth or decline in the ELI rating, and (b) the rate of employment growth rate in the county as a whole.

Independent (explanatory) variables:

- ***Demographic data***: US Census demographic data from 2000 for such variables as the age, education, minority status, mobility, and urban/rural residential location of the county population,
- ***Geographic characteristics***: terrain, elevation, natural amenity, and highway data describing the geographic features and transportation infrastructure of the counties. The terrain and elevation data are from the US Geological Survey (USGS), the transportation data are from ARC and the US Department of Transportation's Bureau of Transportation Statistics. The natural amenity scale is an index of the density of attractiveness of geographic features developed by the Economic Research Service (ERS) of the United State Department of Agriculture (USDA)
- ***Industrial mix and commuting patterns:*** measures of industrial mix, types and business, and commuting patterns within the Appalachian counties. BEA/REIS data break down earned income by industry for 1980, 1990, and 2000. We also develop entrepreneurship indicators from BEA/REIS data on the diversity and value-added components of earned income. Commuting patterns are based on 1990 US Census ''journey-to-work' data.
- ***Density and Urban Influence:*** measures of population density and urbanization for each county and for sub-county regions. These indicators include USDA/ERS measures of population-based rural-urban continuum codes and urban-influence codes; and the delineation of metropolitan and micropolitan areas.

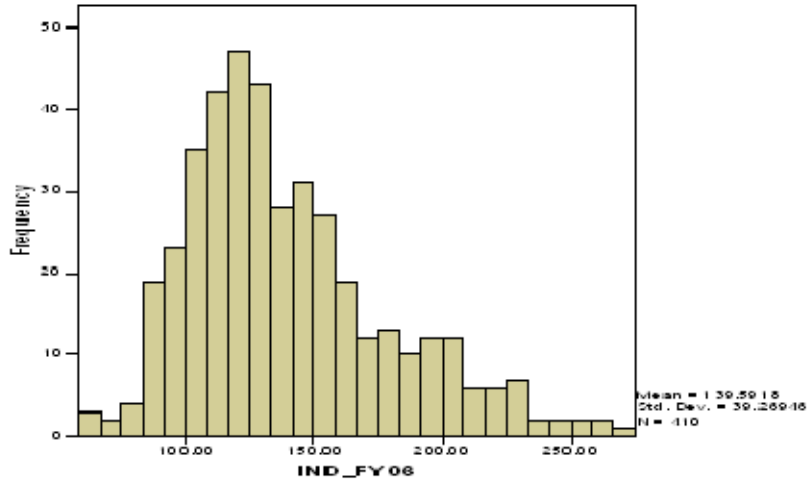
Exhibit 5-1 shows the frequency distributions of ARC's Economic Status Classes (ESC). Exhibit 5-2 plots the frequency distribution of the ELI index. The ELI measure (labeled IND_FY06 for Fiscal Year 2006) is a continuous function of the three measures (unemployment, income, and poverty) used to determine the ESC category. Compared with the four discrete ESC categories, the continuous ELI variable provides more differentiation among counties and, hence, an increased opportunity to explain variations in economic health across counties in terms of the independent variables that we have identified.

Exhibit 5-1: Distribution of County Economic Status Class (ESC)
(Labeled as "DISTFY2006")



Source: ARC's Economic Status Classification.

Exhibit 5-2: Distribution of the county Economic Level Index
(ELI, Labeled as "IND_FY06" for Fiscal Year 2006)



5.3 Models to Predict County Economic Level

A number of researchers have used econometric methods to model economic health (at county levels) as a function of various demographic and socio-economic factors, and industrial mix. However, relatively little work has been done to understand how geography and transportation infrastructure affect the interaction among counties and population centers and, as a result, the pattern and pace of economic development.

We focus our efforts on investigating measures of geographic and infrastructure features that might influence economic health through facilitating, or hindering, the interconnectedness of Appalachian counties – and the resulting speed at which economic growth might occur. GeoDa software allows us not only to run classic ordinary least-squares (OLS) regression models, but also to estimate "spatial-lag" and "spatial-error" regression models that account for additional spatial "spillover" effects that reflect the influence of economic neighbors.

Explanatory Variables. In order to see how much of the variation in ELI across the Appalachian counties can be explained by demographic, geographic, and market segmentation factors, we begin with the following set of measures for various factors that the literature suggests are correlated with economic health. Listed below are the basic explanatory variables used in regression models to predict county ELI levels.

Demographics	
PCTHSGRAD	Percentage of people with high school diploma
PER_MINORI	Percentage of people who are minority
PER_POP65P	Percentage of people over 65 years old
Mobility	
PCTSAMCNT	Percentage of people who resided in the same county 5 years earlier
Amenities	
ASCALE	Natural amenity scale
Entrepreneurship	
BREADTH	Economic breadth = # non-farm proprietors / total non-farm emp
DEPTHINC2	Non-farm proprietor income/# non-farm proprietors
DEPTHVALAD	Non-farm proprietor income, BEA/non-employer receipts
Industrial mix	
AGRIC00	Percentage of income from agriculture in 2000
MIN00	Percentage of income from mining in 2000
CNSTR00	Percentage of income from construction in 2000
MANFC00	Percentage of income from manufacturing in 2000
TRNSP00	Percentage of income from transportation in 2000
WHTRD00	Percentage of income from wholesale trade in 2000
RETRD00	Percentage of income from retail trade in 2000
FIRE00	Percentage of income from finance, insurance, real estate in 2000
SERV00	Percentage of income from services in 2000
GOV00	Percentage of income from government employment in 2000
County interdependence	
RADJ97_EMP	Income adjustment to account for workers' county of residence

(normalized by employment)

In this section, we develop two basic forms of regression model. The first one estimates the role of various county attributes (previously listed) on the Economic Level index (ELI) of each ARC county as of FY2006. The second one adds geography and infrastructure factors to increase explanatory power. For both forms of regression model, a set of four variations is estimated. (Additional regression models of *changes* in county economic health are discussed in the section which follows.)

Exhibit 5-3 summarizes results for the first set of regression models under three different formulations: Ordinary Least Squares, Spatial Lag and Spatial Error. Findings from each of these model variations are summarized below:

Model 1-A. Ordinary Least Squares Regression. Using GeoDa softrware, the ELI rating of each county was regressed onto each of the 18 variables. The R-squared of 0.71 indicates that a linear combination of the independent variables explains 71% of the variance in ELI across counties – a modestly good fit. Most estimated coefficients have the expected sign. For example, the coefficient for education (PCTHSGRAD) implies a predicted decrease of 2.32 in the ELI indicator (i.e., an improvement in economic health because ELI measures the extent of poverty and unemployment) for every percentage point increase in the county's adults who have at least a high school graduate level of education. One other demographic variable was highly significant (with a positive relationship), the percentage of the population who are minority (PER_MINORI). The mobility indicator (PCTSAMCNT) was also significant. This measure is the percentage of persons who lived in the same county five years earlier. High values suggest an immobile population. Both these variables had positive signs indicating that higher percentages were correlated with higher ELI values –i.e. distressed economic conditions.

The ASCALE index measures the quantity and quality of scenic natural features and recreation areas in each county. It was not statistically significant as an explanatory factor. It could be that the economic benefits of natural amenities are accrued not so much by the county in which they reside, but by particular, proximate counties that are key points of access to the amenities, e.g., the valley along a major highway connecting population centers to scenic mountains and national parks. Likewise, the mere presence of a natural amenity does not imply that the county or proximate counties are able to leverage their assets into a thriving tourism economy.

The three entrepreneurship measures show mixed results. The breadth of proprietorship measure (BREADTH) is not significantly different from zero, and the two proprietorship "depth" measures (DEPTHINC2 and DEPTHVALAD) are significant but have opposite signs. Increases in DEPTHINC2 are associated with improved economic health (lower IND_FY06) and increases in DEPTHVALAD are associated with declines in economic health (higher IND_FY06). The standardized beta coefficients indicate that their effects are opposite in sign.

Exhibit 5-3: Coefficient Comparison of MODEL-1 Statistical Variations

	Model 1-A (OLS)			Model 1-B (Spatial Lag)			Model 1-C (Spatial Error)		
Variable	Coeff.	T-Stat	Prob.	Coeff.	Z-Val.	Prob.	Coeff.	Z-Val.	Prob.
CONSTANT	**246.707**	**10.346**	**0.000**	**156.208**	**24.141**	**.0000**	**302.088**	**11.998**	**0.000**
PCTHSGRAD	**-2.326**	**-14.528**	**0.000**	**-1.629**	**0.169**	**0.000**	**-2.636**	**-13.082**	**0.000**
PER_MINORI	**0.555**	**5.198**	**0.000**	**0.513**	**0.094**	**0.000**	**0.507**	**3.901**	**0.000**
PER_POP65P	-0.615	-1.172	0.242	0.004	0.461	0.993	0.387	0.768	0.442
PCTSAMCNT_	**1.374**	**5.800**	**0.000**	**1.078**	**0.208**	**0.000**	**0.696**	**3.089**	**0.002**
ASCALE	-1.338	-1.243	0.215	-0.302	0.948	0.750	0.560	0.523	0.601
BREADTH	-8.386	-0.476	0.634	5.057	15.508	0.744	-2.680	-0.180	0.857
DEPTHINC2	**-2.399**	**-5.865**	**0.000**	**-1.674**	**0.368**	**0.000**	**-1.631**	**-4.182**	**0.000**
DEPTHVALAD	**71.183**	**4.958**	**0.000**	**42.311**	**12.948**	**0.001**	**42.494**	**3.042**	**0.002**
RADJ97_EMP	**-0.682**	**-3.440**	**0.001**	**-0.389**	**0.176**	**0.027**	**-0.411**	**-2.453**	**0.014**
AGRIC00	-297.529	-1.385	0.167	-493.950	188.851	0.009	**-482.146**	**-2.861**	**0.004**
MIN00	-7.076	-0.397	0.691	-9.769	15.634	0.532	-6.054	-0.355	0.723
CNSTR00	-63.832	-1.768	0.078	-69.330	31.674	0.029	-50.697	-1.631	0.103
MANFC00	**-79.504**	**-7.133**	**0.000**	**-61.381**	**9.890**	**0.000**	**-52.132**	**-5.346**	**0.000**
TRNSP00	-37.585	-1.379	0.169	-39.687	23.914	0.097	-52.058	-2.368	0.018
WHTRD00	**-154.474**	**-2.825**	**0.005**	**-150.903**	**47.999**	**0.002**	**-105.494**	**-2.312**	**0.021**
RETRD00	34.988	0.899	0.369	1.825	34.172	0.957	-10.766	-0.346	0.729
FIRE00	-115.927	-1.617	0.107	-102.956	62.869	0.102	-82.349	-1.387	0.165
SERV00	**-45.419**	**-2.558**	**0.011**	**-46.495**	**15.577**	**0.003**	**-32.775**	**-2.158**	**0.031**
LAMBDA							**0.647**	**13.998**	**0.000**
Log-likelihod		-1823			-1786			-1777	
R-Squared		71.0%			77.6%			80.1%	

Dependent variable is the economic level index for FY2006 (ind_fy06).
Coefficients significant at the 0.05 level or better are in bold face.

Source: MIT-DUSP ARC Research Team.

Three of the nine industrial mix variables in MODEL-1A were statistically significant. They are manufacturing, wholesale trade, and services. All three have coefficients with negative signs indicating that sector size increases are associated with reductions in ELI scores which represent improvements economic well-being. The industrial mix coefficients are larger than those for the demographic variables, but that is because the industrial mix measures are fractions ranging from zero to 1.0 while the demographic factors range from 0 to 100%. The standardized coefficients adjust for differences in measurement units and show the much weaker effect.

The negative residential income adjustment (RADJ97_EMP) coefficient indicates that a county is better off (lower IND_FY06) if its residents bring in more wage income from out-of-county than the county's non-resident workers export to their home counties. This is one type of "spatial multiplier" effect whereby counties tend to have improved ELI scores if they experience net gains when earned income accounting is shifted from place of work to place of residence. That is, earned income tends to be spent closer to one's home than to one's workplace, so counties gain an economic stimulus if they house more out-commuters than they employ non-resident workers.

Model 1-B: Spatial-lag Regression. This model regresses ELI on the same 18 variables as before, but now using a "spatial-lag model." That type of regression model assumes that the value of an independent variable in one county spills over to affect the corresponding values in adjacent counties (Anselin, 2003). The model is a weighted regression where the weights are non-zero for counties that are adjacent to one another and the coefficients are estimated using maximum likelihood estimation.

The likelihood ratio test indicates that accounting for spatial-lag is worthwhile, and the effective R-squared increases to 78%. We are not surprised that the estimated coefficients for the most significant variables are somewhat reduced in the spatial lag model. For example, consider the education effect. Spillover effects from better education in neighboring counties could account for what otherwise might be lumped into a larger same-county coefficient in the ordinary least squares regression.

One change is that the size of the agricultural sector (AGRIC00) is now significant, and inverse in its effect, which is counterintuitive. A separate histogram shows that this variable is highly skewed with most values at or near zero and a right tail reaching only to 3 %. We would be better off treating AGRIC00 as a dummy variable indicating which counties had a measurably large agricultural sector.

Model 1-C: Spatial-Error Regression. This model regresses ELI on the same 18 variables as before, but now using "a spatial-error model" in place of the spatial-lag model. The "spatial-error" regression model assumes that the county-to-county spillover occurs indirectly through spatial correlation in the error terms for neighboring counties. That is, the independent variables have only local effects, but factors missing from the model specification are spatially correlated.

The signs and significant variables for the spatial-error model are similar to those for the spatial lag, although the residential persistence variable (pctsamcnt) is now marginal and the transportation sector size becomes significant. Overall, the log-likelihood is slightly higher and the effective R-squared is increased slightly (to 80%).

Both the spatial lag and spatial error runs use simple measures of proximity – spillover effects are assumed to come exclusively from neighboring counties and each adjacent county contributes in the same manner. Even with these simple assumptions, we see evidence of significant spillover effects. The RADJ97_EMP variable adjusts income earned by workers in a county in order to account for the county of residence of the employee. The fact that the RADJ97_EMP (expressed on a per-employee basis) is significant in the OLS regression indicates that income earned elsewhere can matter. The variable is less significant with a much smaller coefficient in the spatial lag and spatial error models, because some of the county-to-county influence is explicitly captured in the spatial lag or spatial error term.

Model 1-D. Consolidating the Industrial Mix. The industry specific variables in all of the preceding models had "multicollinearity" (meaning that a high share of employment in any one industry would tend to bring a lower share of employment in other industries). That makes their coefficient estimates subject to error. To address that, we used *factor analysis* to identify linear combinations of industrial sector percentages that capture most of the variation across counties.

Exhibit 5-4 show the component score coefficients for the extracted factors. For example, a county's 2000 factor score for Factor 1 would be computed by multiplying the coefficients in the Factor 1 column by the corresponding industry mix percentages for agriculture, mining, construction, etc. We see that Factor 1 has a large negative coefficient for manufacturing and large positive coefficients for wholesale and retail trade, fire, and services. So, counties with a high share of employment in services or trade and little manufacturing (relative to the other ARC counties) will have a high score on Factor 1. Alternatively, Factor 2 deemphasizes manufacturing and emphasizes mining, government, and transportation. So, counties with a high share of employment in mining and government, and little in manufacturing and wholesale will have a high score on Factor 2. Similarly, Factor 3 emphasizes government, agriculture, and construction without wholesale trade; and Factor 4 emphasizes construction, transportation, agriculture without government, or services.

Exhibit 5-5 (left side) shows the results of rerunning Model-1C (the spatial error model) with the four composite industry factors substituted in place of the nine industrial sector percentages (labeled as Model 1-D). We see that the fit is slightly better than before, with five fewer variables. Note that the most significant factor among the four is Factor-2 (which is higher where there is more reliance on mining or government activities and less on manufacturing or wholesale trade activities). The large positive coefficient (7.75) indicates that a one standard deviation increase in a county's Factor-2 value correlates with a 7.75 point increase (that is, diminished economic condition) in the ELI score for that county.

Exhibit 5-4, Factor Analysis Results

(Component Score Coefficient Matrix)

	Component			
	Factor-1	Factor-2	Factor-3	Factor-4
agric00	.107	-.031	.443	.519
min00	-.168	.260	-.201	.359
cnstr00	.191	.005	.494	.233
manfc00	-.148	-.472	-.041	-.113
trnsp00	.002	.168	-.401	.433
whtrd00	.264	-.210	-.234	.200
retrd00	.295	.075	-.053	-.331
fire00	.358	-.005	-.035	-.061
serv00	.292	.162	-.218	-.083
gov00	-.099	.365	.278	-.340

Factor Interpretation:
Factor-1: service/trade without manufacturing
Factor-2: mining/government without manufacturing/wholesale
Factor-3: government/agriculture/construction without wholesale trade
Factor-4: construction/transportation/agriculture without government/services

Exhibit 5-5: Coefficient Comparison for Models Using Industry Factors

	Model 1-D (spatial error model using industry factors)			**Model 1-E (commuting shed model using industry factors)**		
Variable	**Coeff.**	**Z-Val.**	**Prob.**	**Coeff.**	**Z-Val.**	**Prob.**
CONSTANT	**243.932**	**9.425**	**0.000**	**268.711**	**10.030**	**0.000**
PCTHSGRAD	**-2.534**	**-13.048**	**0.000**	**-2.781**	**-14.409**	**0.000**
PER_MINORI	**0.443**	**3.683**	**0.000**	**0.616**	**5.370**	**0.000**
PER_POP65P	0.291	0.609	0.542	0.740	1.593	0.111
PCTSAMCNT_	**0.904**	**4.159**	**0.000**	**0.608**	**2.807**	**0.005**
ASCALE	0.577	0.552	0.581	1.376	1.411	0.158
BREADTH	3.227	0.227	0.820	16.695	1.207	0.227
DEPTHINC2	**-1.306**	**-3.470**	**0.001**	**-1.017**	**-2.752**	**0.006**
DEPTHVALAD	**33.612**	**2.486**	**0.013**	**28.460**	**2.125**	**0.034**
FAC1_2000	**-4.173**	**-3.582**	**0.000**	**-4.403**	**-3.827**	**0.000**
FAC2_2000	**7.753**	**6.992**	**0.000**	**6.495**	**5.605**	**0.000**
FAC3_2000	1.639	1.591	0.112	1.279	1.275	0.202
FAC4_2000	**-3.487**	**-3.884**	**0.000**	**-3.317**	**-3.798**	**0.000**
RADJ97_EMP	**-0.507**	**-3.120**	**0.002**	**-0.356**	**-2.270**	**0.023**
LAMBDA	**0.625**	**13.066**	**0.000**	**0.900**	**109.477**	**0.000**
Log-likelihod	-1769			-1754		
R-Squared	80.7%			80.0%		

Model 1-E. Alternative Measures of County Connectivity – Commuting Zones. Both the spatial-lag and spatial-error models presented so far employ a simple notion of spillover, which assumes that each county is only affected by its "nearest neighbors" – with equal weight given to each neighbor. Given the mountainous terrain over much of Appalachia, we might expect that hills, rivers, interstates, and other major obstacles, and convenient infrastructure, could distort the meaning of "adjacency." For example, counties with highly inter-connected development paths might be those along a major interstate running through a valley.

The economic interdependence of counties can amplify the beneficial impact of economic development. If we know how counties are interdependent, then we can devise more effective economic development strategies. Prior versions of Model 1 provided some evidence of significant spillover effects among immediately adjacent counties. The best way to measure county connectivity is likely to depend on the type of development being considered. Analysts who use traditional economic growth models focus on residence/workplace linkages, and they might use commute-sheds to identify well-connected counties. But we envision other development strategies that may use a different notion of connectivity. Consider, for example, asset-based development, such as tourism or mining. In such cases, connectivity and interdependence might involve convenient highway and rail infrastructure connecting the local site to population centers or resource users. Alternatively, a knowledge-based development strategy may require an understanding of alumni networks and university connections. For example, the zip code frequency for home addresses of university students may be a good measure of where a university's education and technology transfer efforts are most likely to be felt.

To explore the usefulness of alternative connectivity measurement beyond "adjacency," we examine the commute-sheds (or commute-zones) for Appalachian counties. The USDA has developed commute-shed data for Appalachia based on US Census Bureau Year 2000 journey-to-work data. Each of the 410 counties is clustered into a commute-shed with other counties that most often share commuters who work in one county and live in the other. GeoDa software can use "commute sheds" to calibrate spatial weights that offer an alternative to the "adjacent county" approach.

Exhibit 5-5 (Model 1-E) shows the results of rerunning the prior model with spatial weights based on the commute-sheds, rather than on county adjacency. The results show little change in the model's explanatory power. Given the significant overlap of commute-sheds and "nearest neighbor" adjacent counties, we are not surprised that the results are similar for these two ways of identifying proximate counties that have intertwined economies. Also, the commute-shed results would probably be improved if we included counties at the edge of Appalachia that fall within commute-sheds that include one or more Appalachian counties.

Model 2-A and 2-B: Adding Geography and Access Factors. The final variation of the economic health models adds considerations of terrain slope, road density and worker accessibility.

- *Terrain Ruggedness – Slope Computations.* Because much of Appalachia is mountainous terrain, we might expect that hills, rivers, interstates, and other major obstacles (and convenient infrastructure) could warp the meaning of "connectedness" to be quite different from "as the crow flies." To investigate such possibilities, we computed a measure of terrain ruggedness based on slope computations. We obtained USGS elevation data, projected it to the Alber's area-preserving coordinate system used by ARC, and then converted it to a raster-elevation model in ArcGIS. We overlaid the grid cell slope (rise/run) estimates with the county boundaries, to estimate average slopes within each county (variable name SLOPE).

- *Nearby Terrain Slopes.* We also computed average slopes for all counties whose centroid fell within 66 kilometers of the target county (variable name SLOPE66). Exhibit 5-6 is a thematic map of the estimated slope of the Appalachian Region with lighter colors indicating locations with steeper slopes. Note the sharp change between the Cumberland Plateau and the Great Smoky Mountains where the Tennessee River Valley corridor runs Northeast and Southwest of Knoxville.

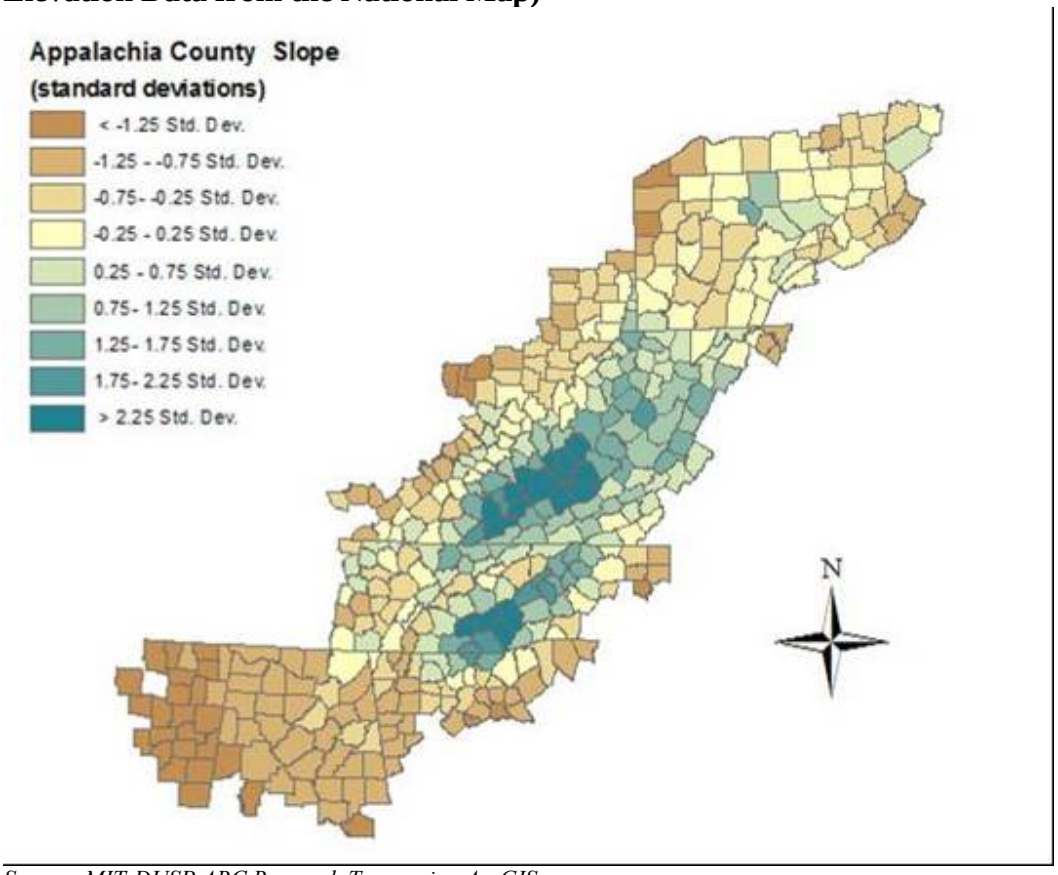
- *Transportation Infrastructure – Road Density.* Our team obtained National highway data from 2004 National Highway Planning Network (NHPN), Federal Highway Administration, U.S. Department of Transportation. We also obtained additional, more detailed, Appalachian Development Highway System (ADHS) data from the ARC. With these data, we developed estimates of road density within each county (variable name ROADWT)

- *Worker Accessibility.* Using data compiled for the Local Economic Assessment Package, we obtained a data set estimating the number of workers who live within 50 minutes driving time of each county. We use this data as a measure of each county's labor market accessibility (variable name EMP50M).

We first ran a new regression model in which we added the access measures and geography measures as cited above. Both a standard OLS regression (Model 2-A) and as a spatial error regression (Model 2-B) were run. However, the results showed that none of the access and geography measures was statistically significant in explaining county-level economic health. It was believed that the reason for this result is that the effect of access and geography is likely to differ for metro and non-core counties. Accordingly, a new variation on the model was run in which coefficients for the explanatory variables were interacted with dummy variables for metropolitan and non-metro areas. That attempt, using metro/ non-metro interaction variables, was more successful. It is referred to as Models 2-C and 2-D, and is discussed and shown next.

(Results for the earlier Models 2-A and 2-B are not shown in this summary although they are shown in the full report.)

Exhibit 5-6: Slope Estimate for the Appalachian Region (Based on USGS 90m Elevation Data from the National Map)



Source: MIT-DUSP ARC Research Team using ArcGIS.

Model 2(C-F): Interaction of Metro Status with Geography and Access. The alternative model specifications included interactions between type-of-county and the other explanatory variables. The interaction of labor market and non-metro status was added in Models 2-C (OLS model version) and 2-D (spatial error model version). The further interaction of slope factors and non-metro status was added in Models 2-E (OLS model version) and 2-F (spatial error model version). In both cases, the spatial error version provided a better fit than the OLS version, although the coefficient estimates were generally consistent across both model types. For brevity, results are shown only for the spatial error versions in Exhibit 5-7 (though results for the other model variations are shown in the full report.)

The spatial error results for Models 2-D and 2-F confirm that the effects of several variables do differ depending on whether a county's status is metro or non-metro. Results are shown in Exhibit 5-7 just for the statistically significant variables. Note

that variables interacted with the metro dummy variable are denoted by an "M_" prefix and those interacted with a non-metro dummy variable are denoted by an "N_" prefix.

The results show that slope and labor force access measures do have statistically significant effects in predicting economic health level, but only in the non-metro counties (indicated by coefficients for variables N_SLOPE, N_SLOPE66, and N_EMP50). We are not surprised by the overlapping effects of employee access and terrain, because we expect that employee accessibility will be lower in mountainous areas and that non-core counties might benefit if the counties that surround them are relatively mountainous and inaccessible.

The coefficient values for the slope variables also show that above average slopes *within a non-core county* (N-SLOPE) are associated with weaker economic levels, while above average slopes *in surrounding areas* (N_SLOPE66) are associated with stronger economic levels. Those findings are plausible. In metro areas, density and infrastructure make the slope and employee access measures less relevant. Also, place-of-residence and place-of-workplace are more likely to span counties in metro areas[16].

Exhibit 5-7: Coefficient Comparison of MODEL-2 Variations

	Model 2-D *Spatial-error model with worker access and road density*			**Model 2-F** *Spatial-error with local and nearby slopes*		
Variable	**Coeff.**	**Z-Val.**	**Prob.**	**Coeff.**	**Z-Val.**	**Prob.**
CONSTANT	**5.67570**	**35.3827**	**0.00000**	**5.66271**	**34.8558**	**0.00000**
PCTHSGRAD	**-0.01688**	**-13.9391**	**0.00000**	**-0.01702**	**-14.0408**	**0.00000**
PER_MINORI	**0.00324**	**4.5158**	**0.00001**	**0.00343**	**4.6660**	**0.00000**
PCTSAMCNT_	**0.00590**	**4.9752**	**0.00000**	**0.00594**	**5.0046**	**0.00000**
DEPTHINC2	**-0.00860**	**-3.6808**	**0.00023**	**-0.00895**	**-3.8275**	**0.00013**
DEPTHVALAD	**0.19684**	**2.2972**	**0.02161**	**0.20793**	**2.4263**	**0.01525**
FAC1_2000	**-0.02636**	**-3.6787**	**0.00023**	**-0.02727**	**-3.8094**	**0.00014**
FAC2_2000	**0.04371**	**6.1400**	**0.00000**	**0.04153**	**5.7560**	**0.00000**
FAC4_2000	**-0.02371**	**-4.3558**	**0.00001**	**-0.02379**	**-4.3710**	**0.00001**
M_RADJ97	**-0.00545**	**-5.7599**	**0.00000**	**-0.00488**	**-4.3712**	**0.00001**
M_ROADWT	**-0.00814**	**-3.7559**	**0.00017**	**-0.00626**	**-2.3412**	**0.01922**
N_EMP50M	**-0.00825**	**-2.6881**	**0.00719**			
N_SLOPE				**0.00584**	**2.6972**	**0.00699**
N_SLOPE66				**-0.00588**	**-2.1887**	**0.02862**
LAMBDA	**0.884**	**92.985**	**0.000**	**0.89497**	**104.1315**	**0.00000**
Log-likelihod	320.9			320.2		
Akaike info	-617.8			-614.5		
R-Squared	83.3%			83.2%		

Source: MIT-DUSP ARC Research Team.

[16] An alternative explanation is that the commute-sheds do a better job of capturing high economic impact regions within metro areas since the weights matrices are not sensitive to the number of cross-county employees.

5.4 Modeling Changes in Economic Health

We have made several attempts to measure *changes* in economic status, so that we could have a stronger econometric underpinning for modeling economic growth over time and space (Anselin, 2003; Feser, 2005). We consider changes in the ELI measure during the last decade, and attempt to estimate and analyze the change in value added (per employee) as a dependent variable between 1997 and 2002 using IMPLAN data. In both cases, the results were limited with, for example, R-square values in the teens. Although we expect lower R-square values when modeling differences, a closer look at the data suggested deeper problems. The time series of annual income and poverty data underlying the ELI measure are based on sample sizes and estimation methods that vary somewhat from year to year. Large samples, such as for the decennial census, are not repeated annually. Hence, year-to-year changes tend to track simple trends. Then, when the next large data sample becomes available, big changes occur all at once in those places that have not followed the fitted curve. The measurement noise that is thereby added to the data can be significant when studying small counties or developing indices that fuse data from different sources or analysis subsectors of the economy.

The most success that we have had with modeling temporal changes in economic indicators for Appalachia has been in studying employment growth during the 1990s after controlling for labor-market conditions and other factors, such as labor mobility, natural amenities, and market size. One member of the research team, worked on this analysis for her Master of City Planning Thesis, "Industrial Structure and Employment Growth in the 1990s in Appalachian Counties."

Before presenting the *economic change* models, we will explain and summarize the measures that we use to characterize economic growth of Appalachian counties during and since the 1990s.

Changes in ELI. It is important to note that the Economic Level Index (ELI) was developed by averaging the county unemployment rate, poverty rate, and per capita market income levels (all expressed as a percentage of the US average). These components are developed from different samples taken at different points in time. When selecting two points in time for use in modeling change, we should be cognizant of the sampling and accuracy issues in the datasets. The ELI estimate for 2004 is the most recent estimate that could be computed using datasets available at the time (in 2005) that we assembled the data – and is the first 2000+ estimate that includes the results of the 2000 US Census. Analysis of the changes in ELI (variable NEW_DELI) showed that the larger improvements tended to be along the edge of Appalachia east of Cincinnati and Louisville or northwest of Atlanta.

Changes in Employment during the 1990s. Because the ELI measure is a composite index of poverty, employment, and income outcomes, it is difficult to construct an

economic model of growth that can directly account for spatial and temporal impacts on ELI. As an alternative measure of changing economic conditions, we examined changes in employment in Appalachia counties during the 1990s. We used the percentage change in employment and adjusted the results (using shift-share analysis) to account for national trends in industrial sectors. The variable CMPT_CAP measures each county's percent change in employment during the 1990s above and beyond whatever change might have occurred if the county followed national trends.

These competitively adjusted changes in employment levels represent a measure of economic growth that can be regressed against demographic, industrial mix, geographic, and other factors in order to identify the conditions that resulted in faster (or slower) growth and to estimate the extent of spatial spillover effects whereby neighboring counties amplified (or, possibly, diminished) the local rate of growth[17]. Tan (2005) explains the methodology in detail.

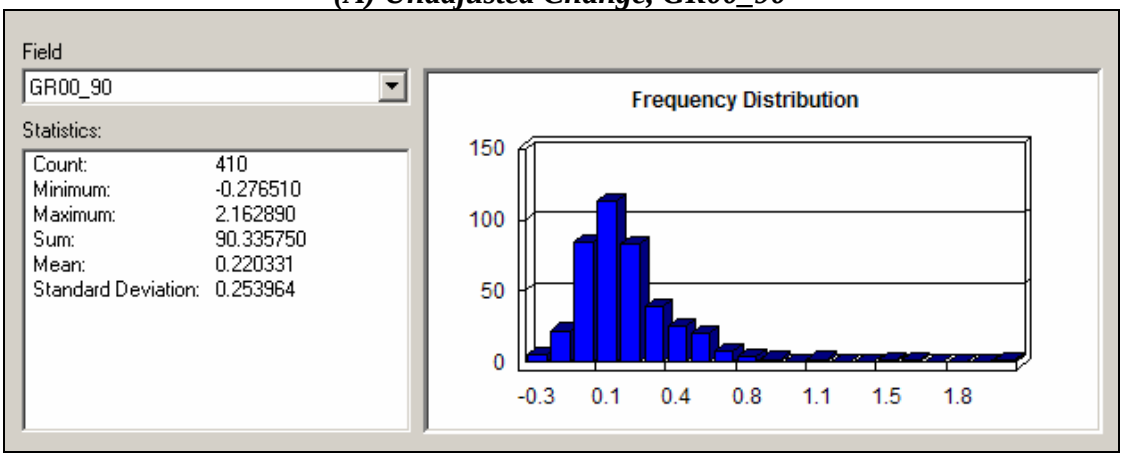
Exhibit 5-8 contains the histogram plots of 1990-2000 employment changes for ARC counties. Part A shows the unadjusted percent changes, GR00_90, and Part B shows the competitively-adjusted changes in employment levels, CMPT90_00. The 1990s were a period of economic growth for the entire nation so the 22% mean percentage increase in employment is no surprise. However, the large range and standard deviation is noteworthy. The distribution of competitively adjusted employment changes is similar in shape and standard deviation but shifted negative (with a mean of -15.9%) because Appalachia counties did not fare as well as the nation on the whole.

Exhibit 5-9 plots these changes in employment thematically across the 410 Appalachia counties. The map on the left shows the competitively adjusted employment changes whereas the map on the right shows the unadjusted employment-change results. A cluster of high-growth counties is evident in the Southeast (that is, northwest of Atlanta). Another group of low-growth counties is visible in the Eastern Kentucky and West Virginia area, but the competitive adjustment tends to temper the magnitude of these changes.

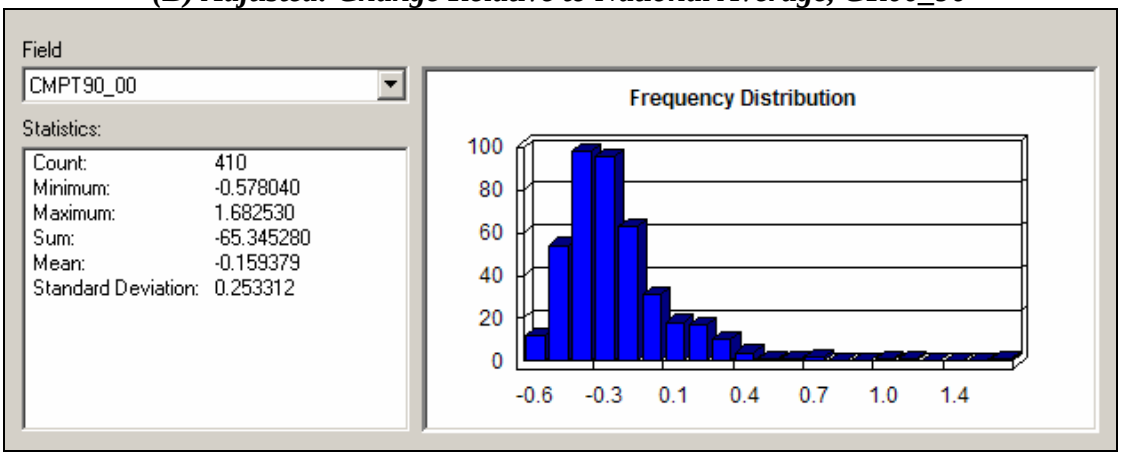
[17] Anselin (2003) has explained how weighted regression fits of such models can estimate first-order spatial-lag and spatial-error effects and Boarnet (1994), Feser and Isserman (2005), and others have developed simultaneous-equation models of employment and population size that can be used to model economic growth and estimate spatial-spillover effects.

Exhibit 5-8: Histogram of 1990-2000 Percent Change in Employment

(A) Unadjusted Change, GR00_90

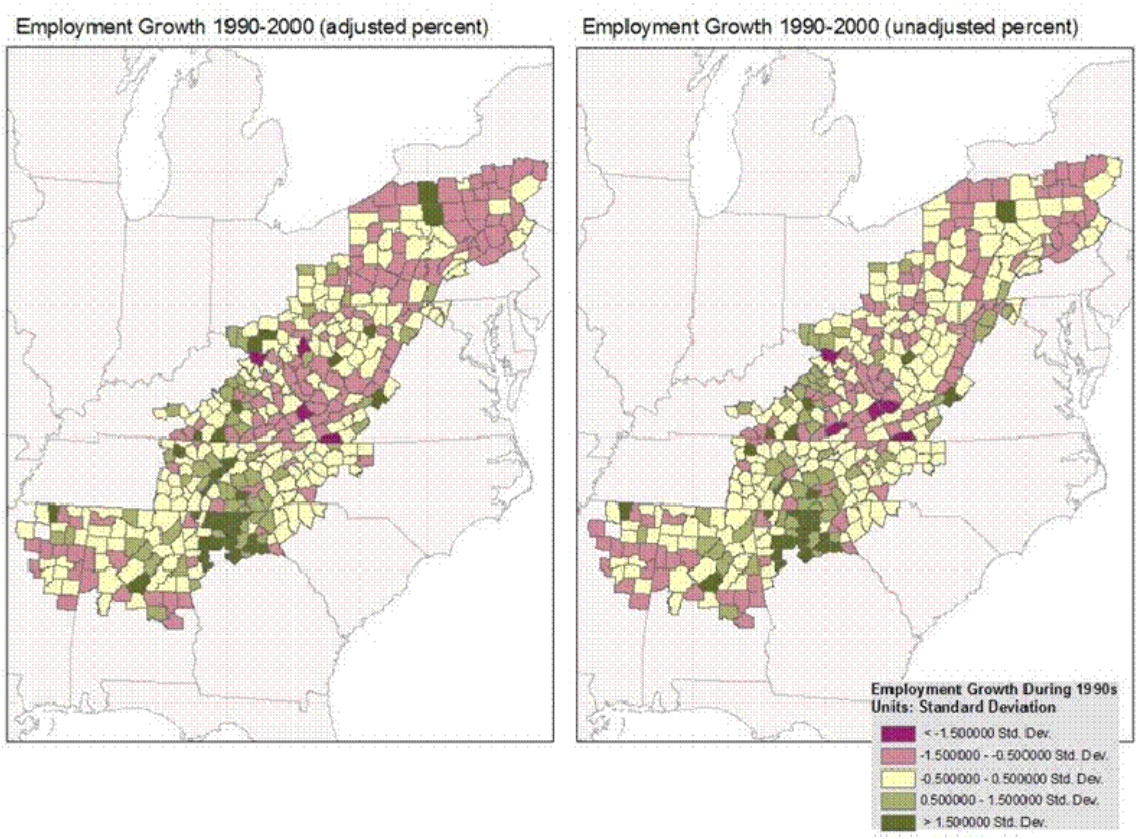


(B) Adjusted: Change Relative to National Average, GR00_90



Source: MIT-DUSP ARC Research Team.

Exhibit 5-9: Employment Change within Appalachian Counties (1990 -2000)
Source: MIT-DUSP ARC Research Team using ArcGIS.



Model 3 and Model 4-A: ELI Rating Change vs. Employment Change. We begin the discussion of *economic change* models by considering the same right-hand-side variables that we used earlier to estimate effects on recent *economic health levels* in Models 1 and 2. Some minor changes are in order, however, because we want the measures of the right-hand side variables at or near the start of the period for which change is observed – 1997 for change in Economic Level Index (NEW_DELI) or 1990 for the competitively adjusted and capped employment change (CMPT_CAP).

Initially, parallel OLS regressions were run to estimate effects on ELI change (in Model 3) and effects on employment change (in Model 4A). The results indicated a poor fit, particularly for the ELI change, where the R^2 indicated that only 16% of the variance was being explained by the model. A substantially better R^2 of 32% was achieved for the model of employment change. Actually, this difference was expected, given the coarse and discrete nature of the ELI rating changes and the smoother nature of variation in the employment change measure. Based on these findings, it was decided that better results could be obtained by focusing on the determinants of employment change, and that the spatial lag and spatial error model forms were likely to yield better fits to the data. Those results are presented and discussed next. (For brevity, results of Model 3 and 4-A are not shown here though they are presented in the full report.)

Model 4(B-C): Change in Employment. Exhibit 5-10 shows the results of models to predict employment change, using both spatial lag approach (Model 4-B includes the rhs variable **W_CMPT_CAP**) and spatial error approach (Model 4-C). Both models attempt to predict the employment change variable using the same right-hand side variables (or their early-90 equivalent) that were previously used in Model 2-A to predict current ELI levels. The results for both new models show better explanatory power (R^2 = 38%) than the previously discussed OLS results. However, the model fit for explaining *economic change* is still far lower than the explanatory power of similar regressions that explained current *economic performance levels*. That is not unexpected, since there is greater variation in the dependent variable depicting a growth rate and the explanatory variables have some updating limitations that were previously discussed.

There are some surprising findings shown in the employment change results. Educational attainment (PCTHSGRAD) is now showing a significant but counter-intuitive relationship on employment growth (this interpretation was acceptable when the dependent variable was current ELI). Adjusted employment growth outcomes in neighboring counties will exert a significant influence on a county's employment changes in the same direction. The key importance of prior industry mix also remains strong, though there are some differences. In the earlier Model 2-A of ELI *levels*, industry factors 1, 2, and, 4 were significant. For the new models of employment *changes*, factors 3 and 4 are significant. They both exert positive effects on the adjusted employment growth that occurred between 1990 and 2000.

Some of the other results are less expected. The industry concentration measure (BEAGINI_9) appears insignificant, as do the economic breadth (BREADTH) and amenity (ASCALE) variables. However, all of these unexpected results can be attributed to correlation with other variables and equally importantly, differences in their impacts within metro vs. non-metro areas.

Model 4(D-F) Metro and Non-Metro Differences. To test this last hypothesis, separate model runs were made for those counties designated by USDA as metropolitan, micropolitan, and non-core counties. The explanatory variables included the demographic variables measuring education, minority and senior citizen presence, and mobility (percent of population living in the same county for at least 5 years); the four industrial mix factors from the factor analysis plus a measure of industry concentration (BEAGINI_9); the three worker access measures counting (counting workers within 40, 50, and 60 minutes) plus the place-of-residence adjustment of worker-based-county income, RADJ97_EMP; and the various geography and infrastructure measures: ASCALE for the USDA amenity index, ROADWT for the weighted percentage of land used for major roads, SLOPE for the average slope, and AVG_SLOPE6 and AVG_SLOPE1 for the average slope of neighboring counties within 66 and 100 km. The results are shown in Exhibit 5-11, and they reveal that the impact of the same explanatory variables differed considerably across the three types of counties.

EXHIBIT 5-10 Model 4-B,C: Models of Employment Change Over Time

	Model 4-B *Spatial-lag model*			Model 4-C *Spatial-error model*		
Variable	**Coeff.**	**Z-Val.**	**Prob.**	**Coeff.**	**Z-Val.**	**Prob.**
W_CMPT_CAP	**0.497**	**14.405**	**0.000**			
CONSTANT	**1.213**	**5.123**	**0.000**	**1.241**	**4.460**	**0.000**
PHSGRAD90	**-0.005**	**-4.254**	**0.000**	**-0.006**	**-3.678**	**0.000**
PMINORI90	**-0.004**	**-3.872**	**0.000**	**-0.004**	**-3.218**	**0.001**
PSAMECNT90	**-0.011**	**-6.033**	**0.000**	**-0.010**	**-5.310**	**0.000**
BEAGINI_9	-0.092	-0.470	0.638	-0.036	-0.190	0.849
F1_1990	-0.023	-1.741	0.082	-0.016	-1.196	0.232
F2_1990	0.008	0.709	0.478	0.005	0.361	0.718
F3_1990	0.026	**2.238**	**0.025**	**0.031**	**2.697**	**0.007**
F4_1990	0.034	**3.307**	**0.001**	**0.030**	**3.075**	**0.002**
RADJ97_EMP	-0.002	-1.327	0.184	**-0.004**	**-2.199**	**0.028**
SLOPE	-0.002	-0.702	0.483	-0.006	-1.836	0.066
ROADWT	0.000	-0.104	0.917	-0.001	-0.150	0.881
EMP50MINK	0.002	1.857	0.063	0.001	0.984	0.325
AVG_SLOPE6	-0.001	-0.267	0.790	-0.002	-0.408	0.683
LAMBDA				**0.698**	**29.578**	**0.000**
Log-likelihod	121.0			121.1		
Akaike info	-211.9			-214.1		
R-Squared	.38			.38		

The results in Exhibit 5-11 show that the best fit was obtained for the metropolitan counties (Model 4-D), with 57 percent of the variability in employment growth explained by the model. For micropolitan counties (Model 4-E), the explanatory power dropped to 33%, and for non-core counties (Model-4-F), the explanatory power dropped to 18.5%.

Not only did the goodness of fit vary, but the selected variables and coefficients vary as well. High school graduation rates (PHSGRAD90) matter for metro and non-core counties (not for micropolitan counties) yet the sign once again is negative as seen above in results for Models 4-B and 4-C – indicating *slower* growth rates in counties with more educated populations. The minority share of the population does not matter in metropolitan counties, matters most in micropolitan counties, and matters somewhat less in non-core counties. In both cases, the sign is negative indicating that counties with higher minority shares grow at slower rates. The adult population share, PROP65_90, matters only for micropolitan counties and also has a negative coefficient. The mobility measure, PSAMECNT90, is significant for all three county types but is estimated to have less than half the impact in non-core counties. Once again, the sign is negative.

Exhibit 5-11: MODEL-4 Stepwise OLS Fits for Metro/Micro/Non-Core Submarkets

		Model 4-D Metropolitan Counties *(109 as of 1993)*				**Model 4-E** Micropolitan Counties *(118 as of 1993)*				**Model 4-F** NonCore Counties *(183 as of 1993)*			
Theme	**Variable**	**B***	**Beta***	**T**	**Sig.**	**B***	**Beta***	**T**	**Sig.**	**B***	**Beta***	**T**	**Sig.**
	Constant	1.848		7.312	0.000	1.265		2.920	0.004	1.071		4.320	0.000
Demographics	PHSGRAD90	-0.009	-0.263	-4.025	0.000					-0.007	-0.435	-5.646	0.000
"	PMINORI90					-0.007	-0.287	-3.261	0.001	-0.002	-0.158	-2.270	0.024
"	PPOP65_90					-0.020	-0.169	-2.142	0.034				
"	PSAMECNT90	-0.018	-0.536	-7.729	0.000	-0.019	-0.347	-4.234	0.000	-0.007	-0.288	-3.812	0.000
Concentration	BEAGINI_9					0.825	0.233	2.665	0.009	-0.439	-0.170	-2.196	0.029
Industry Mix	F1_1990												
"	F2_1990									0.053	0.326	4.200	0.000
"	F3_1990					0.081	0.318	3.615	0.000				
"	F4_1990	0.053	0.212	3.196	0.002	0.044	0.180	2.223	0.028				
Worker Access	EMP40MINK												
"	EMP50MINK					0.026	0.171	2.049	0.043				
"	EMP60MINK	0.003	0.267	3.692	0.000								
Residence	RADJ97_EMP												
Amenity	ASCALE												
Infrastructure	ROADWT												
Terrain	SLOPE												
"	AVG_SLOPE6												
"	AVG_SLOPE1												
	Steps**		4				7				5		
	Adjusted R^2		0.570				0.332				0.185		

** B = the coefficient estimate and Beta = the standardized coefficient estimate*

*** Stepwise ordinary least squares regression of CMPT_CAP (capped, competitively-adjusted employment percent growth 1990-2000) for 410 ARC Counties on the eighteen variables. Separate runs by 1993 USDA County type: Metropolitan, Micropolitan, Non-Core.*

Source: MIT-DUSP ARC Research Team.

The industry concentration GINI measure (BEAGINI_9) is not significant for metro counties but was significant – with different signs – for micro and non-core counties. In micropolitan counties, increased industry concentration correlates with faster growth, but in non-core counties, increased industry concentration correlates with slower growth (and the coefficient estimate was half as large). The results for the industry mix factors are also interesting. Only the fourth factor, F4_1990, matters in metro counties. This factor emphasizes construction/transportation/agriculture without government/services and higher factor scores correlates with faster growth. For micropolitan counties factor 4 still matters (a little less), but factor 3 is even stronger (and also positive). Factor 3 emphasizes government/agriculture/construction without wholesale trade. On the other hand, for non-core counties, only factor 2 matters (positively). Factor 2 emphasizes manufacturing and wholesale trade without mining and government.

The worker access measures matter most for micropolitan counties and not at all for non-core counties. The worker count within 50 minutes, EMP50MINK, performs best for micro counties, but the 60-minute count, EMP60MINK, performs best for metro counties. Note that the coefficient is much smaller for metro counties (0.003 vs. 0.026) but, based on the standardized Beta coefficient, is more influential for metro counties (0.267 vs. 0.171). The worker access distribution is skewed with a long right tail for counties close enough to large metropolitan areas. Hence, the smaller coefficient will tend to be applied to a much larger worker access count, EMP60MINK, for metro counties than for the micropolitan counties that are further from the large metro centers and where the best fitting variable is the 50-minute count, EMP50MINK.

The place-of-residence adjustment, RADJ97_EMP, was not significant for any of the three county types and neither were the amenity, infrastructure, and terrain measures. Because these models predict employment growth by place of employment, we are not surprised that the place-of-residence income adjustment is not relevant (even though it was for earlier ELI models that focused on unemployment, poverty, and income by place of residence). The amenity variable, ASCALE, focuses (as explained earlier) on the scenic and recreational features of a county and other counties might be the ones that benefit economically from these features (e.g., a county along the highway that leads to a national park located in the next county). The terrain measures could well have less effect on 10-year growth than they did for the earlier cross-sectional models. For example, there could be a long-standing advantage to counties in the valley vs. in the hills that explains the much lower density, income, etc. in the hills, even if the recent 10-year employment growth rate is similar.

Another possible explanation for the limited effects of geography in Exhibit 5-11 is that the OLS fits do not account for spatial-spillover effects. The spatial-lag and/or spatial-error models that account for spillover effects within commuting zones consistently outperform the OLS fits. From earlier runs, we see that these spatial models alter the significant variables as well as the coefficient values. Unfortunately,

the models and estimation algorithms needed to handle both county stratification and spatial effects are beyond the scope of this study. For example, commuting zones often include a mix of metro, micro, and non-core counties. We cannot meaningfully run the GeoDa models separately for metro, micro, and non-core counties.[18] Nevertheless, our analyses have provided useful insights into both the factors (and county differences) that influence growth rates and the spatial relationships that influence county interactions. In this section, we summarize these findings and draw conclusions regarding decision tools that can assist in identifying promising development strategies.

5.5 Uses and Limitations of the Findings

The analyses demonstrate the importance of demographic, industry mix, and spatial interactions in explaining differences across ARC counties in their economic health and growth rates. The most interesting results relate to the explicit inclusion of detailed geography, infrastructure, and spatial dependencies in models of economic health and growth. We demonstrated that useful measures of geographic influence could be computed, using modern GIS tools, from readily available data in a manner that is practical and consistent across an area as large as Appalachia. Use of GeoDa has also demonstrated the importance of modeling spatial dependencies explicitly in order to avoid fitting miss-specified ordinary least-squares models that can overstate individual factor coefficients as a result of ignoring spatial dependencies. We have also demonstrated circumstances (the commute shed) in which the nearest-neighbor adjacency was *not* the best way to model spatial dependency.

Nevertheless, despite the progress with improved spatial-analysis tools, the model specifications do not go as far as we would like in linking policy options and development strategies to predicted outcomes. The employment growth model does, indeed, use change data to calibrate the parameters. However, we have not explicitly modeled the development process responsible for observed employment changes. We have not, for example, specified an underlying "economic-growth" model that postulates primary industries, demand for ancillary services, import and export flows, and the like, in order to identify which public investments are most likely to yield the biggest returns through exports and local multiplier effects.

Acquiring the data (e.g., freight flows) needed to calibrate such models is impractical at present, and, in the parts of Appalachia that are most in need of assistance, traditional economic-base analysis is likely only a piece of the tool-kit needed to help inform the right development questions. In the small, non-metro counties that are transitional, the size of the multiplier effect associated with project investment

[18] In order to use tools such as GeoDa to estimate spatial spillover effects for mixed models that allow differing variable coefficients by county type with clusters of 'connected' counties, we would have to transform all the variables and include county-type interaction terms that measured deviations from the main (non-interacting) effects. This is beyond the scope of the current study.

depends on many local factors that are not readily observed and estimated. How much of the new money will recycle locally may not be evident or easily modeled from standard data sources. Also, the "connectivity" mechanism that facilitates spillover and other multiplier effects may not be visible and may be relatively different from a "next-door" adjacency model. A "tourism" strategy, for example, might involve spillover effects along the transportation corridors to the tourist sites, whereas a "knowledge economy" strategy might build social networks that leapfrog counties or even states. The appropriate connectivity matrix for studying (and forecasting) spatial dependencies in these cases could look very different from either the nearest-neighbor or the commute-shed examples that we considered.

Consider, for example, that the employment growth models worked best for metropolitan counties (57% explained) and least well in non-core counties (18% explained). Upon reflection, these variations are not surprising because the traditional export-base model of economic growth is likely to work better for metropolitan areas with sizeable economies, and well developed infrastructure and commute sheds. A further analysis of the Appalachian commute sheds also showed that most include a mix of at least two county types.[19] Many of the more distressed counties are in commute sheds that include no metropolitan county.

Rather than try to identify a single, complex model for explaining growth across all county types, it may be more useful to turn the question around and ask which of several types of models is most appropriate for a county depending upon the characteristics of that county and its neighbors. If, for example, a county has favorable demographics and is in a commuter shed that includes a metropolitan area, then a traditional economic development strategy aimed at the commuter shed may be beneficial and able to capitalize on favorable spillover effects for that county. However, if the commuter shed includes only non-core counties without favorable demographics and industry mix, then traditional development strategies may not be effective, and growth in neighboring commuter sheds might even have unfavorable "backwash" effects.[20] For these counties, more promising development strategies might focus less on commuter-shed 'neighbors' and more on supply-chain possibilities or amenity-driven development. Would it make sense for the county to grow its warehouse facilities, is the county along the path from a population center to potentially attractive amenities, etc.?

Research our team conducted for the white papers and other aspects of the project suggests that, for many transitional counties, the development choice is not a matter of fine-tuning the investment strategy and choosing the one with the biggest multiplier. Instead, it is likely to involve sizing up whether one or another of a few plausible growth paths is practical, given the current circumstances for the county and its

[19] The map also highlights the need to include non-ARC border communities in further analysis because many one- or two-county commute sheds at the edge of the Appalachia region are really part of a larger commute shed, including sheds oriented toward metropolitan centers outside ARC.

[20] A recent study by Feser and Isserman (2005) of employment and population growth in all US counties provides evidence of both favorable spillover and unfavorable backwash effects for non-metro counties.

neighbors. In order to make tourism work, a county needs access to tourists, desirable venues, highways and motels, etc. For a retirement community, or industrial park to work, a different set of questions would be asked. The most effective use of empirical analyses may be to support these evaluations with good (electronic) bookkeeping and visualization. How many people are less than two hours driving distance away from their work? Which counties will benefit from (or contribute to) a new development in a county if the county undertakes certain type of strategies? What gaps exist in the supply or demand for services, infrastructure, skilled workers, etc. What questions should a county ask in order to see if one or another growth model is plausible for the county? Is the county near a metropolitan area, along a transportation corridor, etc.? Modern web-mapping tools and online services are making it practical to acquire data and develop visualization tools and indicator systems that can greatly facilitate "what if" dialogues with citizens and local agencies. Fieldwork and case studies will help when combined with the kind of empirical analysis we have done to measure geographic constraints, neighborhoods, and opportunities. Also, analysts might use outlier counties identified by models, such as the ones we calibrated, to identify places to look for success/failure examples.

Such an approach suggests a policy-oriented decision strategy that:

(a) identifies different sets of potential partners for each county based on the growth model that might be emphasized (for example, counties in the same commuting zone for traditional export-base growth, but counties along the TVA riverway for particular supply-chain analyses, or counties along a highway corridor for certain amenities strategies),

(b) compares the characteristics of the county (and its "neighbors") with those suggested by the relevant right hand side variables for *the growth model that matches the particular development strategy being contemplated* to see whether one or more of these strategies has the factor levels needed to suggest a high likelihood of success (e.g., do not use an export-base strategy for an isolated county with poor transportation infrastructure),

(c) checks whether the type of economic development that is anticipated will be structured in a way that leaves value-added in the county (e.g., mining can benefit locals a lot or a little depending on whether most of the value-added is recirculated in the community or shifted to remote shareholders), and

(d) identifies complementary investments (e.g., in other "neighboring" counties) that would help the group of "neighbors" assemble the factors needed to tap local synergy and enhance the likelihood of success.

5.6 References

Anselin, Luc, Attila Varga, and Zoltan Acs. 1997. "Local Geographic Spillovers between University Research and High Technology Innovations." *Journal of Urban Economics*. 42: 422-448.

Anselin, Luc, Attila Varga, and Zoltan J. Acs. 2000. "Geographic and Sectoral Characteristics of Academic Knowledge Externalities." *Papers in Regional Science*. 79: 435-443.

Anselin, Luc. 2003. "Spatial Externalities, Spatial Multipliers, and Spatial Econometrics." *International Regional Science Review.* 26 (2): 153-166.

Domar, Evsey. 1946. "Capital Expansion, Rate of Growth, and Employment." *Econometrica* 14 (April): 137-147.

Feser, Edward, and Andrew Isserman. 2005. *Urban Spillovers and Rural Prosperity*, University of Illinois, Urbana-Champaign.

Goodchild, Michael 1986. *Spatial Autocorrelation*, CATMOG 47, Norwich, UK: Geo Books.

Henry, Mark S., David L. Barkley, and Shuming Bao. 1997. "The Hinterland's Stake in Metropolitan Growth: Evident from Selected Southern Regions." *Journal of Regional Science,* 37(3): 479-501.

Isserman, Andrew M., and John D. Merrifield. 1987. "Quasi-Experimental Control Group Methods for Regional Analysis: An Application to an Energy Boomtown and Growth-Pole Theory." *Economic Geography*, 63 (1): 3-19.

Jaffe, Adam 1989. "The Real Effects of Academic Research," *American Economic Review,* 79(957-70).

Karkalakos, Sotiris. 2004. "The Spatial Boundaries of Regional Technological Productivity in European Union." Working paper.

Leichenko, Robin. 2000. "Exports, Employment, and Production: A Causal Assessment of US States and Regions**."** *Economic Geography,* 76 (4): 303-326.

Martin, Ron, and Peter Sunley. 1998. "Slow Convergence? The New Endogenous Growth Theory and Regional Development." *Economic Geography*, 74(3): 201-227.

Ramajo, Julián, Miguel Márquez, and María del Mar Salinas. 2004. "Spatial Patterns in EU Regional Growth: New Evidence about the Role of Location on Convergence." (*mimeo, en evaluación)*

Sala-i-Martin, Xavier. 1996. "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence," *European Economic Review*. 40: 1325-1352..

Schaffer, William A. 1998. *A Survey of Regional Economic Models*. Atlanta, GA: Georgia Institute of Technology. http://www.rri.wvu.edu/WebBook/Schaffer/chap02.html

Smirnov, Oleg, and Alena Smirnova. 2000. "An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia." Report to the Appalachian Regional Commission, report from Bruton Center for Development Studies, School of Social Sciences, The University of Texas at Dallas.

Solow, Robert. 1956. "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Development Economics* 70(1): 65-94.

Stirboeck, Claudia. 2004. "A Spatial Econometric Analysis of Regional Specialisation Patterns across EU Regions." ZEW Discussion Paper No. 04-44. http://ssrn.com/abstract=560884

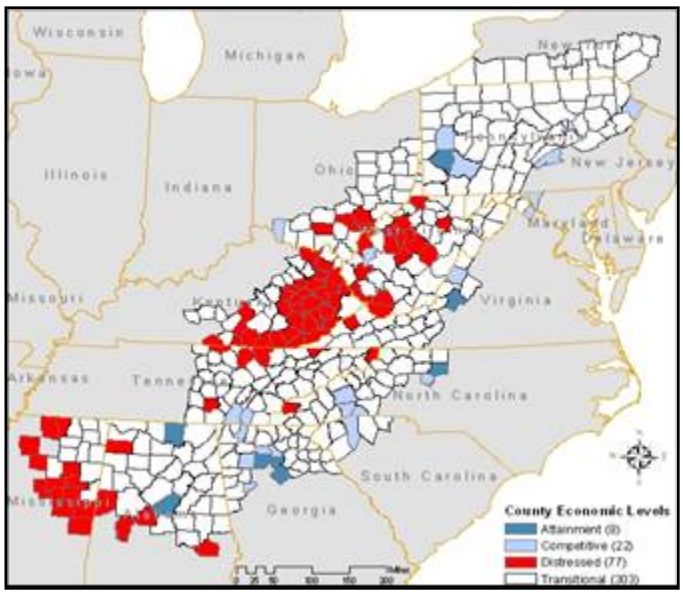
Tan, Zhijun, 2005. "Industrial Structure and Employment Growth in the 1990s in Appalachian Counties," MIT MCP Thesis (August) Cambridge, MA: Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Vias, Alexander C., and Gordon F. Milligan. 1999. "Integrating Economic Base Theory with Regional Adjustment Models: The Nonmetropolitan Rocky Mountain West." *Growth and Change*, Vol. 30 (Fall): 507-525.

Widner, Ralph R. 1990. "Appalachian Development After 25 Years: An Assessment." *Economic Development Quarterly*, 4(4): 291-312.

Sources of Regional Growth in Non-Metro Appalachia

Vol. 4 Economic Development Assessment Tools and Study Conclusions for Identifying Sources of Growth



Prepared for the Appalachian Regional Commission

Prepared by:

Economic Development Research Group, Inc.

Revised 2007

SOURCES OF GROWTH PROJECT

The *Sources of Growth* project is part of a series of research efforts funded by the Appalachian Regional Commission to improve our understanding of factors affecting economic growth in rural and distressed areas. As stated in the Volume 1 Introduction, "the starting premise of this project is that there can multiple paths that an area can pursue in successfully enhancing job and income creation. They may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. The resulting direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development." This research is intended to provide a basis of information that can ultimately be useful for enhancing the effectiveness of policies and tools aimed at improving the region's economic development.

This is Volume 4 in a series of reports prepared as part of this project:

- ***Executive Summary*** –synthesis of findings from all work products related to the study's four main research components.

- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties, classification of economic development growth paths, and synopsis of white paper findings on theory relating to economic development growth paths.

- ***Volume 2, Case Studies of Local Economic Development Growth Processes*** – findings related to growth paths as observed for selected case studies covering manufacturing industry specialization clusters, supply chain-based development, tourism-based development, advanced technology development, and diversification from resource-based economies.

- ***Volume 3, Statistical Studies of Spatial Economic Relationships*** – findings from a series of econometric modeling and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.

- ***Volume 4, Economic Development Assessment Tools & Study Conclusions*** – description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** – (A) Spatial Analysis of Economic Health, (B) Economic Analysis of Hub-Spoke Relationships, (C) White Papers on Economic Growth Theories, (D) Literature Review of Empirical Studies on Spatial Influences in Economic Development.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This volume was authored by Economic Development Research Group, Inc. Other volumes in this series were also co-authored by staff of Regional Technology Strategies, Inc. and by faculty and graduate students in the Dept. of Urban Studies & Planning at the Massachusetts Institute of Technology.

The Sources of Growth project involved a team of researchers including:

- Economic Development Research Group, Inc. (EDRG) – Lisa Petraglia (Project Director), Glen Weisbrod (Principal-in-Charge) and Teresa Lynch, with research support from Tyler Comings, Brett Piercy and Susan Moses;

- Regional Technology Strategies, Inc. (RTS) –Stuart Rosenfeld, Phil Psilos and Dan Broun;

- Massachusetts Institute of Technology, Department of Urban Studies & Planning (MIT-DUSP) – Prof. Karen R. Polenske, Prof. Joseph Ferreira, Jr. and Ayman Ismail, with research support from Tan Zhijun, Isabelle Xin Li, Yi Xu and Leigh Graham.

The project also benefited from the expertise of outside policy and research experts who reviewed documents, participated in project meetings and provided technical guidance: Deb Markley (Co-Director of the Center for Rural Entrepreneurship, a Rural Policy Research Institute), Joseph Cortwright (Vice-President of Impresa Consulting), Ken Poole (Executive Director of ACCRA: The Council for Community and Economic Research), David Freshwater (Professor of Agricultural Economics and Public Policy at the University of Kentucky), David McGranahan and Luc Anselin (Professor. Dept. of Agriculture & Consumer Affairs and Regional Economics Applications Laboratory at the University of Illinois, Urbana-Champaign).

Overall project direction and oversight was provided by Dr. Greg Bischak of the Appalachian Regional Commission, whose wide range of research experience served to focus the project team on the development of policy applications. Important insight and suggestions were also provided by officials of the Appalachian Regional Commission who participated in a day-long symposium with the project team, including Thomas Hunter (executive director of ARC, Ann Pope (federal co-chair of ARC) and Rick Peltz (alternate federal co-chair). In addition, Ken Wester and Jason Wang of ARC assisted the project team in collecting and assembling transportation and geographic data.

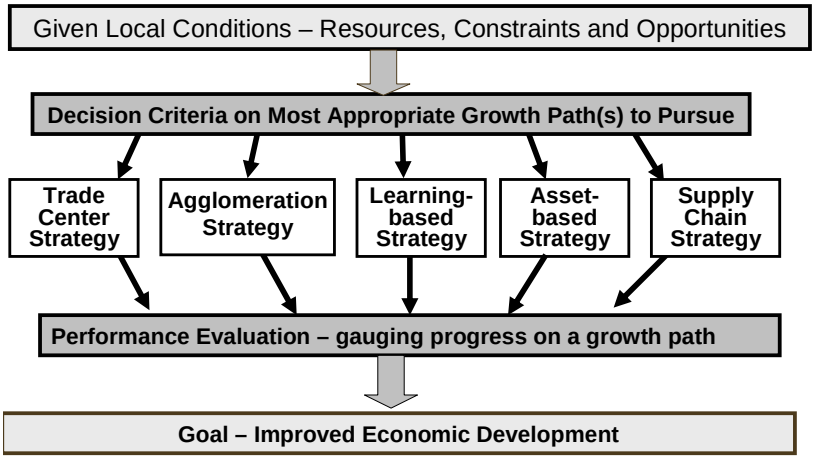
1 INTRODUCTION

1.1 Overview: From Research to Action

The Appalachian Regional Commission (ARC) is recognized in the field of economic development, not only for its program investments that have been shown to create jobs, but also for its research aimed at improving the effectiveness of its economic development efforts. The *Sources of Growth* project is part of that research effort aimed at improving our understanding of factors affecting economic distress and identifying strategies that can enhance economic growth in the region.

One of the most important elements of the Sources of Growth project is that it aims to illuminate the range of potential *economic growth paths* that can be relevant for rural areas (Exhibit 1-1). It avoids the "urban bias" that exists when people focus just on in-vogue concepts such as technology-driven clusters. Instead, it lays out multiple paths that areas can potentially pursue to create jobs and income. For any specific area, though, some growth paths are more likely to succeed than others. Hence, successful economic development requires analysis to identify the relevant growth paths.

Exhibit 1-1 Alternative Growth Paths



The prior three volumes describe theory, prior research, case studies and empirical analysis of economic growth factors -- all generating insight and implications for local policy initiatives in Appalachia's non-metro counties, where economic distress is greatest. This volume discusses our ability to use those findings to improve tools that can be used by ARC's Local Development Districts (LDDs) for assessing their economic development opportunities and developing growth path strategies.

1.2 ARC Role in Developing Economic Tools

ARC-Opps Spreadsheet Tools. The ARC started providing tools for enhancing economic development targeting and strategy when it released the highway opportunities model: *ARC-OPPS* in March 2001.[1] That system of analysis tools was designed to help ARC's Local Development Districts identify the type of business growth opportunities that come along when areas gain new or improved highway access. It was motivated by concern that local economic development agencies were often not fully prepared to identify or pursue new opportunities created when segments of the Appalachian Development Highway System (ADHS) were completed. ARC-OPPS was successfully used for various ADHS links such as Appalachian Corridor "V" in Mississippi and Appalachian Corridor "T" in New York State. However, this system also created interest in expansion of developing broader tools to assess economic development targeting opportunities for regions that did not have new highway openings.

ARC-LEAP Spreadsheet Tools. In January 2004 the Appalachian Regional Commission (ARC) issued the report and software tool known as *ARC-LEAP, the Local Economic Assessment Package*.[2] Building on the demands of the ARC's Local Development Districts (LDDs), this product provided the LDDs with a robust package of economic development assessment tools that could assist development practitioners in their local economic planning efforts. This package superseded ARC-OPPS by covering the economic and employment impacts of other types of development projects, including water and sewer projects, industrial site development, workforce development, and transportation improvements.

ARC-LEAP was widely distributed among Appalachian state and local government economic development programs. The Southern Tier West Regional Planning Council in New York was an early adopter of the LEAP package to evaluate how transportation accessibility affected economic development opportunities in his region, and to assess development options for distribution centers and the lodging sector. Another example was the First Development District of Tennessee, which engaged in a strategic planning process utilizing the capabilities of LEAP to identify key development opportunities for the region. The Middle Georgia Regional Development Center used LEAP as the foundation for a larger effort to develop a regional economic diversification strategy plan. It was also used for Tennessee DOT's evaluation of the potential economic development benefits of completing Appalachian Corridor "J".

---

[1] *Handbook for Assessing Economic Opportunities from the Completion of Appalachian Development Highways*, by Economic Development Research Group with the assistance of Cambridge Systematics, March 2001. Available at http://www.arc.gov/index.do?nodeId=709

[2] *Handbook: Assessing Local Economic Development Opportunities with ARC-LEAP, Appalachian Regional Commission Local Economic Assessment Package*, by Economic Development Research Group, January 2004. Available at http://www.arc.gov/index.do?nodeId=2203

Recognition Awards. During the 2005-2006 period, LEAP began earning national recognition and awards from the IEDC - International Economic Development Council and ACCRA – the Council for Community and Economic Research. Both of these recognition awards noted the unique capabilities of LEAP in enabling local economic development agencies to effectively assess their targeting strategy options, and both were given jointly to ARC and Economic Development Research Group (EDRG) in recognition of their partnership in its development.

Web-Tools: EDR-LEAP®. While the LEAP spreadsheet-based toolbox was gaining critical success, its use was limited to agencies that had the staff time and resources to collect all of the information required to use it. In response to this need, EDRG developed a new system that overcame this problem by having: (a) essentially all of the data already collected and immediately available via a dynamic database and geographic information system, and (b) the entire system available on-line and directly usable through any web browser, with help screens for new users. ARC made the system available to Appalachian Local Development Districts and Appalachian State Economic Development Departments. (It is available to other users through EDRG.[3])

The initial version of EDR-LEAP® assessed local economic performance gaps, barriers holding back further development, business attraction target opportunities and effects of program or policy initiatives. It also included some evaluation of business cluster opportunities. However, it did not fully distinguish the alternative growth paths that can be important for any region, but particularly for rural districts where there is not necessarily a critical mass of population and employment to support business clusters. Findings from the *Sources of Growth* project -- including literature review, case studies and empirical studies – now provide a base for further enhancing the breadth of analysis and use of this tool.

1.3 Need for Economic Assessment Tools

The concept of local economic assessment is not new. It goes back at least forty years, with "*economic base analysis*" and its set of ratio calculations to identify their economic performance strengths and weaknesses.[4] These methods started appearing in guides for economic development agencies in the 1970s.

In the later 1980s and most of the 1990s, there was also a flurry of research ranking business *site location factors.* Today, there is now a strong consensus on the nature of the key business location factors, which represent local competitiveness factors for economic developers. Those factors are shown in Exhibit 1-2.

Together, the evaluation of economic performance (via economic base analysis) and the evaluation of economic competitiveness factors (via analysis of site location

[3] See www.edrgroup.com/leap for further information and links to contact information.
[4] This includes LQ (Location Quotient), S (Shift-Share) and VAMP (value added minus payroll per employee).

factors) provided a foundation for guides such as *Economic Development Planning,* International Economic Development Council (2002).

Exhibit 1-2. Business Site Location Factors [5]

- Suitability of Business Parks, Land and Buildings
- Scale and Skills of the Labor Market --Workforce
- Scale and Socioeconomic Characteristics of the Consumer Base
- Availability and Quality of Infrastructure -- roads, power, water/sewer, broadband telecom, intermodal transportation terminals and connections
- Access to Markets, as well as to airports, marine ports and intermodal rail terminals
- Business Support services & business climate – job training, regulations, business organizations
- Quality of life -- including climate, arts and culture, recreation, and school quality
- Cost of doing business – including labor, utilities, infrastructure and taxes

1.4 Pitfalls in Using Economic Tools

Note: Most of this part 1.4 text is drawn from a separate article, "New Tools for Economic Development Targeting and Strategy: Applying a Local Economic Assessment Package" by Glen Weisbrod and Brett Piercy, 2006. publication pending.

The full value of an integrated evaluation and targeting system such as LEAP comes from its ability to offer a coordinated toolkit that effectively support economic development targeting and strategy development. As a coordinated toolkit, it avoids the common limitations and pitfalls that come from reliance on simpler methods or bundles of separate tools. Examples of these problems include the following:

- While area-wide industry mix patterns and trends are easy to assess, most economic developers understand that such information is of limited value unless it can be compared to relevant neighbor and competitor areas to identify performance gaps, and then linked to business competitiveness factors to help explain those results.

  The problem of over-reliance on industry patterns and trends is that they can lead to a naïve conclusion that already strong industries represent clusters that

[5] Industrial site location factors are widely recognized in the field of economic development today, though most of the research to identify them took place over the prior decade. Sources include: (1) *Portland 2002: Strategy for Economic Vitality*, Appendix 2-3: "Location Factors," 2002, (2) Sloagett, Gordon and Mike Woods. "Critical Factors in Attracting New Business and Industry in Oklahoma. Oklahoma Cooperative Extension Service; (3) Kotler, Philip et al. *Marketing Places*. The Free Press, 1993; (4) Lyne, Jack, "Quality of Life Factors Dominate Many Facility Location Decisions," *Site Selection Handbook*, August 1988, and (5) Finkle, Jeffrey. "Developing Strategies for Economic Stability and Growth," Council for Urban Economic Development, 1997. For quality of life, also see (6) Segedy, James. "How Important is Quality of Life in Location Decisions and Local Economic Development" in Bingham and Mier (Eds.) *Dilemmas of Urban Economic Development*, Sage, 1997.

should be the top priorities for further recruitment. More appropriately, economic development strategies should focus on identifying existing gaps and missed opportunities, desired growth paths and the steps needed to overcome barriers now holding back achievement of those opportunities.

- Measuring cost differences among regions is a straightforward process, and the nature of those differences forms a core of economic simulation and forecasting models. Those models focus on estimating dollar flows and cost differences to explain how industry growth and investment moves among areas. However, most economic developers understand that business location requirements also depend on various non-cost (size, quality and access) factors that are at least as important as cost in determining competitiveness and resulting industry growth and investment shifts.

  The problem of over-reliance on cost comparisons is that they can lead to a naïve conclusion that local economic development strategy should focus just on cost incentives to attract economic growth. Often, economic development strategies need to focus more on identifying opportunities to overcome gaps in transportation facilities, job training, industrial park facilities and/or business support services as ways to enhance quality.

- Economic forecasting and impact models can show how a given type of new business will generate additional flows of dollars to suppliers. However, most economic developers understand that *part of their job is to make economic forecasting and impact models be wrong.* That is because economic forecasting models usually assume no change in competitiveness factors aside from costs, while economic developers may be working hard to make quality improvements in local facilities, job training or support services. In addition, economic impact calculations assume that dollars will "leak" out of the area if there are currently no local suppliers to serve a major new industry, while economic developers may be working hard to develop local supply chains that can keep those dollars in the local economy.[6]

  The problem of reliance on economic forecasts and impact models is that they

[6] An economic impact model applied before the opening of the BMW assembly plant in South Carolina would normally have calculated that the flow of dollars to auto parts suppliers would go mostly out of state, since there was no major auto parts industry in the state at that time. It would not have known that the cooperative efforts of BMW and the state would subsequently lead to the attraction of 49 new auto parts suppliers, creating thousands of additional jobs.

can lead to a pessimistic view of future prospects for local economic development, and wrong priorities for industry growth and attraction targets. More appropriately, economic developers need to take advantage of opportunities to enhance local supplier networks as a way of enlarging the indirect benefits of business expansion and attraction efforts.

2 OVERVIEW OF LEAP

2.1 LEAP Structure

In recognition of these shortcomings, the Appalachian Regional Commission supported development of the "Local Economic Assessment Package" as a bundle of tools to give economic developers the ability to diagnose local competitive position, select appropriate targets and design economic development targeting strategies that build on strengths and minimize weaknesses. The resulting package of tools follows the evaluation process supporting IEDC's *Economic Development Planning* guide and recommended targets and policy priorities. It is designed specifically to avoid the pitfalls just discussed.

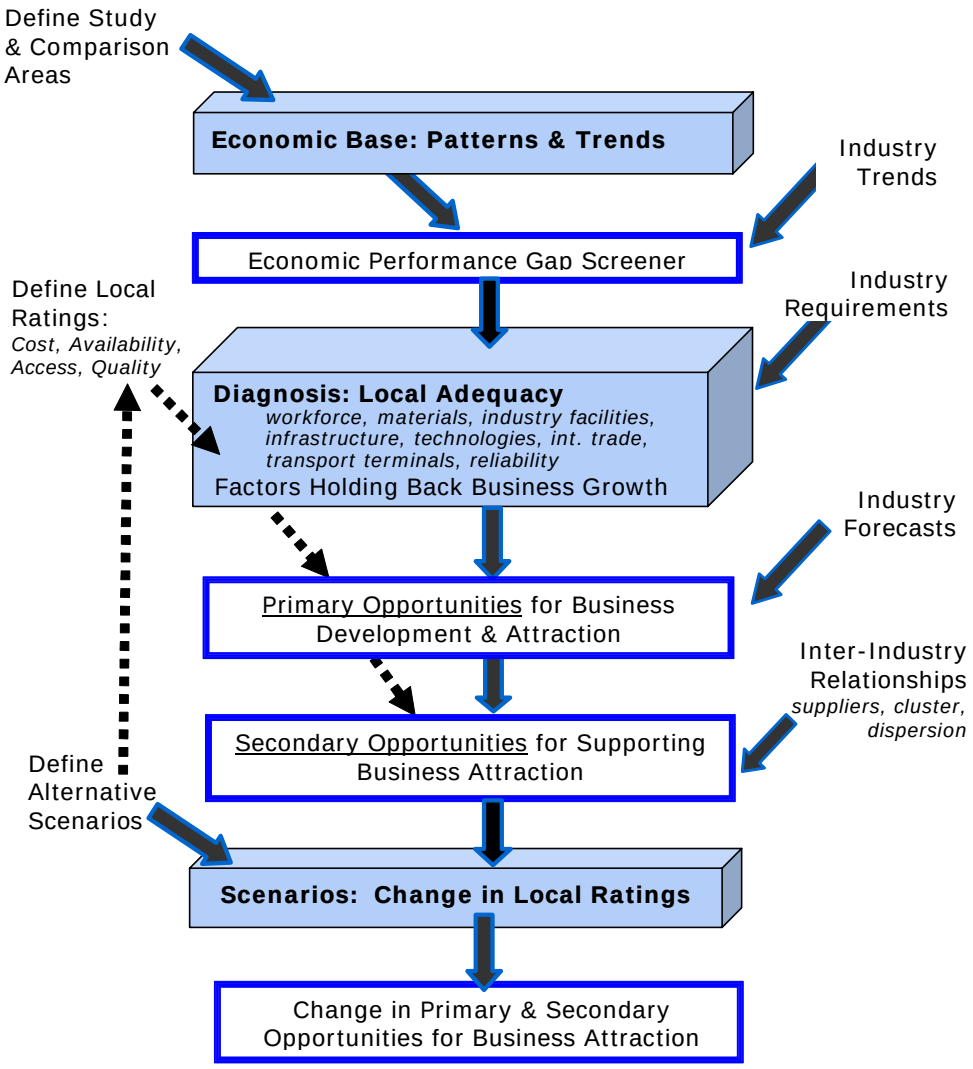
The structure of this approach is shown in Figure 2. It revolves around three steps or modules, shown by the shaded three-dimensional boxes: (1) Economic Assessment, (2) Targeting Diagnostics and (3) Policy Analysis. They implement the three-phase evaluation process that was previously discussed to provide information for the IEDC economic development planning process. Most importantly, it avoids or minimizes the pitfalls of incomplete and inappropriate conclusions by making the critical connection between (a) local economic performance results to date and (b) local competitiveness factors (costs, quality, access and market scale differences). That provides a basis for determining (c) potentially feasible business growth/attraction targets and actions needed to make them possible. The steps are as follows:

- *Economic Base Assessment* – This step develops profiles of business mix and performance trends by industry, and benchmarks them against adjacent or competing areas to identify leading & lagging industries, performance gaps and business types with the greatest local growth or attraction potential.

- *Targeting Diagnostics* – This step rates competitive strengths and weaknesses of the area in terms of various costs (e.g., utilities, housing g, land, labor, taxes), qualities (worker skills, industrial/office park amenities), access (to airports, highways, railroads) and supporting infrastructure (broadband, business resources). It uses a knowledge base of industry requirements, thresholds for business location, and inter-industry relationships to identify the key factors that are constraining local attractiveness for each industry, and potentially achievable business attraction targets.

- *Policy Analysis* – This step allows users to assess how changes in economic development conditions can affect the size and nature of potential future business attraction. It estimates changes in job growth associated with positive or negative changes in labor skills training, industrial/office park amenities, land availability, broadband access, and/or transportation accessibility. It provides a basis for prioritizing future economic development initiatives.

Figure 2. LEAP Structure



An interesting aspect of this integrated system design is that it is flexible in the choice of economic development targeting objectives, as the assessment of gaps, opportunities and targets can be viewed in terms of (a) job creation, (b) income generation, (c) maximizing local value added or (d) increasing business sales. The choice can make a big difference in findings and recommendations, as some industries

are growing in business sales while jobs or effective salaries are being cut. It is also flexible in the choice of comparison areas for benchmarking, which can be adjacent areas, national or regional competitors, or other areas that will be linked by new transportation corridor connections. That decision also depends on the purpose and use of the analysis.

Recognizing its flexibility, this system has now been adopted by the Appalachian Regional Commission and distributed to its Local Development Districts in 13 states to support and enhance their economic development targeting efforts. Applications of it have won national recognition awards from IEDC - the International Economic Development Council and ACCRA – the Council for Community and Economic Research.[7]

2.2 Elements of Integrated Evaluation

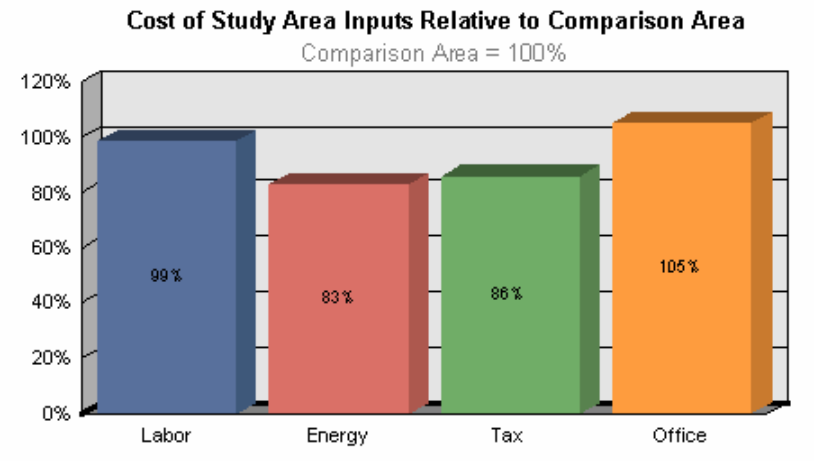
Assessment of the Economy. As noted by economic development textbooks, the three principal tools that form the starting basis for economic base analysis are Location Quotient (business mix analysis), Shift Share (business trend analysis), and SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.[8] These techniques are not new and they often form part of Comprehensive Economic Development Strategy (CEDS) documents funded by the US Economic Development Administration.

Nor are these techniques inherently complicated. In fact, they can be done quickly with spreadsheets following instructions in regional economic textbooks. The difficulties lie in (a) collecting data on dozens of industries at the appropriate level of detail, and then (b) making the right comparisons to extract findings on local strengths and weaknesses.

This is one area where LEAP diverges from traditional analysis approaches. The traditional approach for economic base analysis has been to compare a local area against national patterns and trends. Economic models similarly also compare local costs against national costs. The problem, of course, is that a rural region does not necessarily expect to compete against big metro regions for the same industries, nor does a lake recreation area expect to compete against mining or industrial centers. That is why a benchmarking approach, which compares local industry mix patterns and growth trends against relevant competing areas, will lead to totally different types of findings on local gaps than a comparison to state or national averages. Figure 3 is a graph generated by LEAP that illustrates a comparison of business cost factors in a study area relative to a user-defined comparison area.

[7] ACCRA 2006 National Award for Applied Research; IEDC Honorable Mention for Research Studies, 2005
[8] Bendavid-Val, Avrom. Regional and Local Economic Analysis for Practitioners, fourth edition. 1991.

Figure 3. Relative Cost Factor Comparison



Targeting Diagnostics. The diagnostic phase of LEAP includes an assessment of local advantages and disadvantages for each industry in which there is a potential for further business growth and attraction, as identified in the assessment phase. This set of diagnostics identifies "critical" and "important" weaknesses that need to be addressed if the area is to fulfill some of the growth potential identified in the local area assessment.

A major problem holding back systematic analysis of economic development opportunities in the past has been difficulty pulling together information on just how a local area stacks up against competing areas in terms of various "competitiveness factors" -- which can range from very specific (such as tax and utility rates) to very vague (such as business climate and quality of life). Traditional economic models sidestep the problem by ignoring those non-dollar factors and concentrating instead on the more easily measured business output trends and costs. Yet economic developers know that these scale, quality and access factors can be at the core of economic competitiveness and addressing them can be critical to achieving success in business growth and attraction.

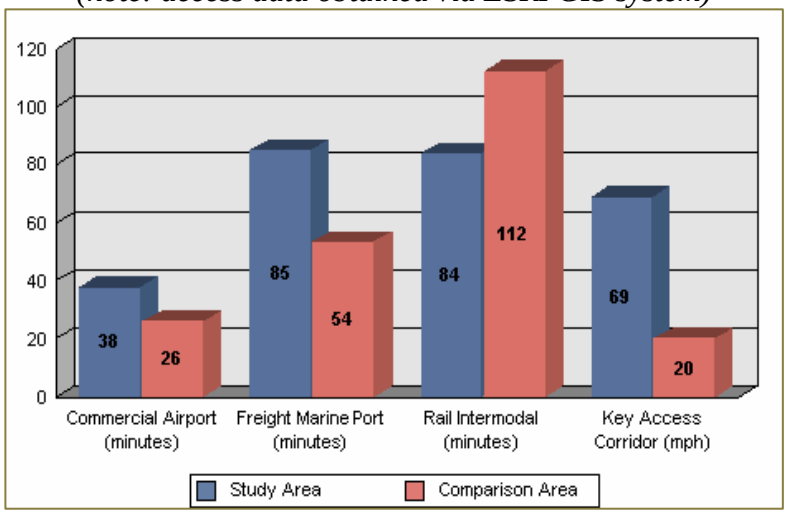
The LEAP approach takes this issue of information assembly head on, as it attempts to recognize all of the major business location considerations that are important to economic developers. The solution is two pronged:

- *Use of Broader Data Sources.* Information on many factors that are not readily available can in fact be obtained through an up-front research effort to tap proprietary databases, with costs greatly reduced if they are spread over many users. That is done with an on-line version of LEAP, which includes measures for every US county of: (a) costs factors including labor, utilities, taxes and buildings, (b) size and quality factors including delivery markets and education characteristics of the workforce accessible within a 40 minute drive, (c) access

times and size of available commercial airports, marine ports and intermodal truck/rail terminals, and (d) availability and magnitude of broadband facilities, recreation activities and international exports. Figure 4 illustrates this type of comparison.

- *Use of Local Information Worksheets.* To assess local conditions for some important factors that are not readily available, it is necessary to rely on locally completed worksheets. These include ratings based on detailed criteria for judging the quality features of local business parks and buildings, quality ratings for local training, business support services and business climate, and quality rating for local tourism support facilities and services. Practitioners have shied away from such measures in the past because they require judgment in assessing business facilities and supporting resources. However, the LEAP approach is based on an understanding that these factors cannot be fully measured by available public or proprietary databases, but they also cannot be ignored. By providing and allowing for optional use of local assessment worksheets, the system can provide a more robust and complete picture of local competitiveness factors.

Figure 4. LEAP Comparison of Area Access Characteristics
(note: access data obtained via ESRI GIS system)



Opportunities and Barriers. The crux of the matter, then, is to connect an area's economic performance gaps (unfulfilled opportunities) to its shortfalls in the various competitiveness (cost, scale, quality and access) factors. To diagnose which of the competitiveness factors are acting as barriers to business growth and attraction, LEAP relies on a base of information concerning detailed industries, their relative business requirements for these factors, and the how industries respond to changes in these factors. This approach recognizes that industries must meet thresholds for some factors in order to make their business operations economically viable at a given

location. For instance, the thresholds can be minimum market size requirements (common for financial and business services), maximum access times to airports (common for electronic products), and/or delivery time and reliability requirements along supply chain corridors (common for just-in-time automotive parts). Additional elements of the information base include baseline industry growth forecasts and inter-industry supplier and buyer relationships, which together provide information on how attracting one industry can create spatial cluster opportunities to also attract additional growth through complementary industries.

In this way, LEAP identifies sets of industries that are good targets for economic development based on the match of local characteristics and the operating requirements of each industry. For those industries that are currently lagging but could offer future growth opportunities, it identifies the nature of current disadvantages that need to be overcome in order to effectively promote more local business activity. Figure 5 shows an example of a LEAP diagnostic report and the resulting identification of factors responsible for current industry performance gaps.

Figure 5. LEAP Diagnosis of Factors Holding Back Economic Growth in a Sample Study Area

Barriers Factors by Industry (1=Critical, 2=Important)

Performance Measurement = Employment
Actual Number of Jobs

NAICS	Sector	Potential Attraction	Prod Cost	Labor Cost	Land Cost	Energy Cost	Tax Cost	Work Force	Labor Skill	Water Trans	Air Trans	Rail Trans	Broad Band
511	Publishing Industries (except Internet)	814	-	-	-	-	-	-	2	-	2	-	-
514	Internet & data process svcs	507	-	-	-	-	-	2	-	-	1	-	-
521-523	Monetary, Financial, & Credit Activity	7,758	-	-	-	-	-	-	2	-	-	-	1
524	Insurance Carriers & Related Activities	6,394	-	-	-	-	-	1	2	-	-	-	-
533	Lessors of Nonfinancial Intangible Assets	387	-	-	-	-	-	1	1	-	-	-	1
541-551	Professional Scientific, Technical, Services	12,904	-	-	-	-	-	2	2	-	2	-	1
561	Administrative & Support Services	18,306	-	-	-	-	-	2	-	-	1	-	-
621-624	Health Care & Social Services	6,609	-	-	-	-	-	1	-	-	2	-	1
721-722	Accommodations, Eating & Drinking	23,057	-	-	-	-	-	-	-	-	-	-	-
811-812	Repair, Maintenance, & Personal Services	2,887	-	-	-	-	-	-	-	-	-	-	1
813	Religious, Civic, Professional, Organizations	5,203	-	-	-	-	-	1	-	-	-	-	1
	TOTAL	84,826											

Armed with these diagnostics, LEAP identifies industry targets with the greatest opportunities for direct business attraction, the magnitude of potentially achievable growth, and the factors that must be addressed to realize those results. It also helps practitioners consider opportunities for building upon inter-industry linkages – in other words, sets of industries that build on common needs and buyer-supplier relationships. Complementary industries are types of business which are not primary target industries, but which may nevertheless represent growth opportunities because they are suppliers of goods and services to the primary target industries or otherwise interact with them. In this case, any direct opportunities for business growth may also indirectly create opportunities for growth in complementary industries that do not directly depend on highway access.

Policy Analysis considers how some barriers to business growth and attraction can be minimized or overcome by the programs and projects of local planners and economic developers. Local public policies and programs and projects can include improvements in the availability and adequacy of local education, workforce skills training, infrastructure enhancement, business site development, access to airports, sea ports, and rail; and improvements to highways or initiation of improved support services. By applying the base on information on industry growth factors, the system can then identify the potential impact of proposed policies or projects on business attraction, and present estimates of the range of resulting impact on jobs, income, value added or business output. The impacts are expressed in terms of range estimates, based on risk factors including industry volatility and sensitivity to business cycles.

Follow On Actions. Economic development targets identified from LEAP will only be achieved if a strategy plan is put in place to address remaining needs and to actively entice such business growth and attraction. Once potential opportunities for targeting future business growth and attraction have been identified, along with needs for addressing existing barriers, the economic developer must devise a process to work with other area agencies and leaders in forging a strategy plan. This includes agreement on targets and goals, and a program of action steps covering organizational, staffing and financing plans to pursue the goals, as well as some form of monitoring and evaluation of results.

2.3 LEAP Uses for Appalachian Growth

Performance Indicators. For regional and state economic development agencies, LEAP was designed to be used in several ways. First, it provides economic development performance indicators, reflecting the area's economic performance, trends and growth opportunities, as well as comparison of those performance indicators to surrounding areas or counterparts elsewhere. LEAP provides a large volume of key information that would take considerable effort for local economic development agencies to assemble and process themselves. This includes the following

- The core data on *employment and business output* (patterns and shifts over time) is provided through a cooperative agreement with Minnesota IMPLAN Group, Inc. (MIG). It is developed from information compiled by the US Bureau of Economic Analysis, US Bureau of Labor Statistics, Zip and County Business Patterns, and the Economic Census, with additional enhancement to provide full details for small areas without suppression. We update aggregate estimates using information from more recent Dun & Bradstreet.

- Additional information on local concentration of *international exports* and local purchasing patterns is also provided by MIG under cooperative

agreement. The export estimates are based on International Trade Administration data, while further analysis of local source purchasing is derived from calibrated IMPLAN models.

- *Local travel times, accessibility measures, delivery markets and labor markets* are derived from highway network drive times along with business and demographic data, using a Geographic Information System (GIS) from ESRI.

- *Other local information* includes: (a) workforce characteristics, educational attainment and housing costs derived from the US Census; (b) Utility costs derived from the Energy Information Administration, Edison Electric Institute and Energy User News; (c) Local taxes and government revenues compiled from the Census of Government; (d) Airport, marine port, and freight intermodal facility locations and activity levels are based on inventories maintained by the US Dept of Transportation.

Support for Strategic Review. A second use of LEAP results is use of its evaluation reports to support both internal organization strategy and outside information dissemination. This includes the following:

- Profile of *business attraction strengths and weak nesses*, such as the size of the labor market and delivery market, availability of transportation and broadband telecommunications facilities, and workforce education.

- Tracking *change in the local area economy* is changing over time, in terms of gains and loses in employment and/or business sales in various local industries. Also identify local industries where local business sales are gaining while jobs are dropping as a result of increasing outsourcing and/or mechanization).

- Comparison of local *performance relative to adjacent or competing areas* (or the state as a whole), to identify how the local area has been over- or under-performing in terms of its business mix and business growth performance.

- Benchmarking of *local competitiveness* for various growth paths, by showing relative differences in workforce skills, educational attainment, transportation access, broadband penetration, and quality of industrial parks.

Strategy Development. Finally, LEAP can provide information that can help guide strategy for pursuing various growth paths. This includes the following elements:

- Identification of *barriers* holding back local current success in promoting business growth and attraction economic performance: LEAP identifies the specific factors that are constraining local business growth and attraction, and the specific industries that are being constrained.

- *Target Industries* that represent opportunities for business attraction. LEAP identifies the best industries to focus on, the magnitude of the potential opportunity and the extent of uncertainty associated with it. It also identifies mutually supporting and complementary industries that can be an indirect element of a growth strategy.

- *Policy Actions* that can affect the type and size of industry growth opportunities and targets. LEAP allows you to estimate how proposed scenarios for enhancing industrial parks, transportation infrastructure, job training and business support services may change target opportunities.

3 USE OF FINDINGS FROM SOURCES OF GROWTH PROJECT

3.1 Enhancing Analytic Capabilities

The *Sources of Growth* project provided a synthesis of theory and prior research on growth paths, a day-long workshop of experts in the field, and empirical studies of factors affecting economic growth in Appalachia. As summarized in the prior three volumes, these efforts highlighted critical considerations in defining alternative growth paths and their determinants. That has enabled us to identify ways in which LEAP tools can be improved to better serve the needs of Appalachian LDDs and State Economic Development Agencies. These improvements fall into three categories:

- **Defining Growth Paths.** Until now, LEAP has focused on evaluating and identifying appropriate *target industries* for local areas. However, the research conducted for this study suggests that there can be additional value in explicitly identifying classes of *target growth paths* (rather than just target industries) that local areas can pursue in their economic development strategies. An example of such a classification is shown in Exhibit 3-1.
- **Rating Existing Situation.** Until now, LEAP has focused on characterizing existing conditions through *ratings of local economic performance* and trends. However, the research conducted for this study enables us to also develop *ratings of localized growth specialization*. Such ratings can reflect the extent to which a local area is already specializing as a resource-based, learning-based, tourism-based, supply-chain based or trade center based economy.
- **Rating Potentials for Alternative Growth Paths.** Until now, LEAP has focused on recommendations of economic growth opportunities in terms of *potential industries*. However, the research conducted for this study provides us with a further capability for recommending *potential growth path directions* based on potential competitive advantages such as labor skills, road networks, climate or technology infrastructure features.

Exhibit 3-1. Definition of Six Major Classes of Economic Growth Paths

Basis for Area's Economy Growth	Description
Trade Center	Growth pattern emanating from a small urban cluster that provides goods and services to the exurban communities & rural hinterlands
Agglomeration (*e.g.* cluster economy)	Growth resulting from geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries.
Supply-Chain (*e.g.* dispersal economy)	Remote location is chosen over the central metropolitan area to host a node of economic activity (distribution or assembly) that is part of a larger (geographic) production chain.
Natural Amenity or Cultural Assets	Growth as a result of either quality-of-place attracting new households –or – efforts to actively develop & promote cultural, recreation, eco-tourism venues and their supporting visitor services.
Knowledge (Learning) Assets	Growth opportunities leveraged from the collective knowledge embodied in the region, including social capital, technical applications / commercialization, institutional assets (educational and financial), entrepreneurial start-ups.
Other Growth Paths: Natural Resources and Government	Growth made possible by the existence of long-standing mineral, lumber or agricultural resources, or by the decision of government agencies to site major regional or national facilities in an area.

The remainder of this chapter describes various measures that can be constructed to assess the current growth path status of an area or the factors affecting local potential for various growth paths. The measures that are listed and discussed in the rest of this chapter are not intended to represent a complete list of desired or possible metrics. Rather, they are intended to represent what is known to be currently possible given (a) publicly available data sources and (b) proven metrics that have been demonstrated in the literature of prior studies (described in Volume 1) or recent empirical studies (described in Volume 3).

These various measures represent potential additions to enhance the value and use of LEAP for assessing growth path opportunities. At the time of this report's publication, some have been implemented, some are planned for implementation in the near future and others are still in the proposal or development process. Updates on the status of these changes will be posted for participating registered users of the LEAP system, including Appalachian Local Development Districts and Appalachian State Economic Development Agencies at www.edr-leap.com ..

3.2 Trade Center Development Paths

A micropolitan trade center provides goods and services to a surrounding rural "hinterland." It depends on having a small but critical base of population and employment, a nature junction of traffic routes serving surrounding areas, and distance or topographical features that encourage residents and employees in those surrounding areas to visit this trade center location rather than other adjacent or nearby areas as their center for buying retail goods and consumer services. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with trade center indicators rating for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of trade center-based economies is provided in Volume 1. It indicates that a trade center is characterized by having a larger than normal concentration of retail stores and consumer and professional services (barbers, doctors, loan companies) than would be expected, given its population base. Of course, a given area may be a strong trade center that is well-serving a large surrounding area, or it may be a weak trade center that only partially services outside areas. This leads to the following proposed indicators of existing conditions:

- *Economic Base Indicator: Consumer Trade-Based Concentration* – This indicator is defined as the ratio of local employment in retail + consumer services + professional services, divided by local population.

- *Trade Center Micro/Metro Rating* – This indicator is defined as the county or place that has a high rating for the above-cited consumer-based concentration and is also designated by the US Census as a "metropolitan center" or "micropolitan center" on the basis of net inflows of workers coming in from surrounding counties.

Rating Potentials for Future Trade Center Growth. Discussion of the determinants of trade center-based economies are provided in Volume 1 as well as case studies in Volume 2. In addition, relevant research on economic hubs, spokes, and market area effects are described in Volume 3. These documents focus on transportation, topography and population clustering patterns that create centers of consumer trade activity serving surrounding trade areas that do not have similarly strong centers of activity. This leads to the following diagnostic indicators:

- *Economic Base: Trade Linkages*– Technically known as a "spatial lag multiplier," this measure is an indicator of the extent to which economic activity for each industry in a given county is supported by demand generated in neighboring counties. It is calculated by considering the industry mix of each county and that of neighboring counties and information on inter-industry relationships. It effectively captures situations where one county is serving as

the hub of economic activity for other surrounding counties. Details of this measure are provided in the Volume 2, Chapter 2 report where it was successfully used to explain trade center growth. It is based on work by Ismail at MIT, updating original work by Smirnov.

- *Labor Market Area (Scale)* – This is an indicator of the size of the workforce or population base that lives within a given (40, 50 or 60 minute) drive time of the population center of a county. It thus reaches into neighboring counties to calculate a "market area", which can be interpreted as an indicator of the relative size of both the labor market for any industry and the shopper customer market for retail and consumer service industries. This measure is constructed on the basis of geographic information systems and highway network drive times. It is a variant of the population base used for analysis in Volume 2, Chapter 4 of the Sources of Growth Study. This indicator is now implemented in EDR-LEAP.

- *Composite Trade Center Indicator* – This indicator combines spatial lag multipliers or trade area indicators with information on distance to the closest larger city or urban county. It is intended to overcome a problem confronting both of the preceding indicators, which is that they assume a strong central city surrounded by a rural hinterland, and can provide misleading results when there are actually multiple cities of significance in a multi-county region. For instance, the spatial lag multiplier seemed to indicate that Scioto County, OH was a strong trade center when it found economic strength in that county and evidence that residents of surrounding counties were going outside their home counties for purchasing of goods and services. However, the case study (in Volume 2, Chapter 2) found that the residents of those surrounding counties were actually shopping in extra-regional metro centers due to new highway access thereby creating an adverse backwash effect on Scioto County. By measuring the distance to next larger cities or urban counties, this error can be minimized.

3.3 Industry Agglomeration Cluster Paths

Agglomeration-based economic growth is based on development of geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries. It most often depends on achieving some form of: (a) economies of scale in operations of a single industry, or (b) economies of vertical integration associated with clustering industries that buy from and sell to each other, or (c) economies associated with several industries sharing a common skill or resource base in a given region. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with agglomeration cluster indicators rating for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of agglomeration -based economies is provided in Volume 1. It indicates that an industry agglomeration cluster is characterized by having a larger concentration of individual production-based sectors and their directly complementary sectors, relative to the rest of the economic base mix. This leads to the following proposed indicators of existing conditions

- *Economic Base: Manufacturing Concentration* – This indicator is an index reflecting the extent to which any one or more manufacturing industries have a higher concentration (location quotient) in the study area that the statewide average.

- *Economic Base: Vertical Integration of Suppliers* – This indicator is an index reflecting the extent to which the dominant manufacturing industries also have a strong relative concentration of their suppler industries within the region. That is determined by using the tables of inter-industry purchasing patterns (technology coefficients) within BEA national input-output tables. These input-output relationships are already in use within LEAP for the identification of indirect business attraction opportunities; the proposed new measure would use that information for also assessing existing industries.

Rating Potentials for Future Industry Cluster Growth. Discussion of the determinants of trade center-based economies is provided in Volume 1, along with the manufacturing case study (Alabama's auto manufacturing cluster) in Volume 2. These documents focus on the scale and density of industries, workforce skills and supporting facilities, as well as their cost and quality. This leads to the following diagnostic indicators:

- *"Effective Density" of Opportunities Rating* – This is a composite indicator of the productivity gain associated with increasing the effective density of activities reachable from a center of industrial activity. It is calculated on the basis of population based within 40 minutes of the population-weighted center of the core county, divided by the land area of the county. It effectively represents density of the county population, modified to add extra "effective density" if additional outside population is close by. This measure is based on research results of "Productivity and Metropolitan Density," by Timothy Harris and Yannis Ioannides, Tufts Univ. Dept of Economics, 2000. This measure is now implemented in LEAP.

- *Gap Analysis: Vertical Integration of Suppliers* – This is the flip side of the economic base measure cited earlier. It reflects that proportional magnitude of the gap between (a) level of local employment in suppliers to the dominant manufacturing industry, and (b) the theoretical maximum employment if all suppliers were locally present.

- *Barrier Analysis: Cost Competitiveness* – This is a composite measures of the

local cost of labor, energy and transportation inputs for each industry, relative to competing areas or other comparison areas. It is calculated using relative weights for the degree to which each industry makes use of labor, energy and transportation factors in is production process. This calculation is now implemented in LEAP.

3.4 Supply-Chain (Dispersal) Paths

Supply-chain based economic growth is based on development of suppliers and distributors strung along a highway corridor. This arrangement makes use of dispersal economies for keeping labor costs low, and it makes use of transportation connection efficiencies associated with same day delivery. In some cases, it also makes use of multi-modal delivery connections (e.g., intermodal truck-rail or truck-air connections). The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with supply chain ratings for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of supply chain economic growth is provided in Volume 1. It indicates that a supply chain-based economy is most often characterized by having a larger than normal concentration of distribution facilities and/or parts suppliers to assembly plants (e.g., metal or plastic product fabricators serving auto plants). This leads to the following proposed indicators of existing conditions

- *Economic Base: Logistics Concentration* – This is an index reflecting the extent to which warehousing/distribution, wholesaling, and trucking industries have a higher concentration in the study area that the statewide average. This is reflected in a composite "Location Quotient" for those logistics-related industries.

- *Economic Base: Fabricated Parts Suppliers* – This is an index reflecting the extent to which metal, plastic or glass fabrication industries have a higher concentration in the study area that the statewide average. This is reflected in a composite "Location Quotient" for those fabrication industries.

Rating Potentials for Future Supply Chain Growth. Discussion of the determinants of supply chain -based economies is provided in Volume 1 and the auto alley case study in Volume 2. These documents focus on the roles of labor cost, industry mix and location relative to highways, in addition to highway and connections with intermodal rail and air terminals. This leads to the following diagnostic indicators:

- *Major Highway Access* – This is constructed as a measure of distance from the county population-weighted center to the nearest four-lane or interstate level highway. Alternatively, the county's mileage of four lane highways can be

used to reflect the extent of highway access occurring in the county, as done in the "Twin County" study described in Volume 3, Chapter 3. Either way, the highway measure can be used with the measures of logistics and fabricated parts suppliers to improve the indicator of supply chain supporting activity.

- *Drive time to Commercial Airport* – This is a measure of the highway drive time from the county population-weighted center to the nearest public airport with regular commercial scheduled airline service. It is combined with information on the magnitude of service provided at that airport (measured in terms of the number of annual commercial airline takeoffs and landings), so that both airport proximity and airport size (service level) are reinforcing positive factors. This interaction reflects the new empirical analysis described in Volume 2, Chapter 4. The measure also requires a database of commercial airport facilities from the FAA, and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Drive time to Commercial Rail Intermodal Terminal* – This is a measure of the highway drive time from the county population-weighted center to the nearest freight truck-rail intermodal terminal with regularly scheduled commercial scheduled freight train service. It requires a database of commercial truck-rail intermodal interchange facilities (from USDOT) and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Drive time to Commercial Marine Port – river to sea* – This is a measure of the highway drive time from the county population-weighted center to the nearest marine (river or sea) port with regularly scheduled commercial marine ship or barge service. It requires a database of commercial marine terminals with regular service (from USDOT) and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Labor Force Scale Rating* – This is a measure of the population or workforce living within 40 minutes drive time from the county population-weighted center. A minimum level of workforce is needed to attract warehousing, wholesaling and related logistics-related industries, as shown in Volume 3, Chapter 4. Thus this measure can be interacted with the preceding four transportation access measures to develop more refined measures of potential area attractiveness for growing supply-chain based activities t an area.

3.5 Amenity & Cultural Asset Growth Paths

Amenity and cultural assets are "*quality of place*" features that can serve to attract new households to an area for a tourist visit or as a retirement destination. The attractions can be climate, interesting mountains or water features, and/or developed cultural activities or recreation venues. The plan is to improve LEAP by providing each

county or group of counties (comprising a region or Local Development District) with amenity and cultural asset activity ratings, for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of amenity and cultural asset-based economies is provided in Volume 1. It indicates that this type of growth path is characterized by a concentration of lodging, meal and/or recreation activities, serving either day visitors or overnight visitors. This leads to the following proposed indicators of existing conditions:

- *Economic Base: Lodging, Restaurants and Recreation Concentration* – This is an index reflecting the extent to which local lodging (hotel, motel and camping), meals (restaurants, bars and takeout establishments) and recreation services have a higher concentration of employment in the study area than the per capita statewide average for those activities. This is reflected in a composite "Location Quotient" for those visitor-serving industries. This has now been implemented in LEAP.

- *Housing/Population Base: Retirees* – This is an index reflecting the extent to which the local area has a higher share of population that is retired and living in the region shorter than five years. It draws information from the US Census Bureau and their Current Population Survey.

Rating Potentials for Future Amenity & Cultural Asset-Based Growth. Discussion of the determinants of amenity and cultural asset -based economies are provided in Volume 1, as well as the case study of asset-based growth (e.g Chautauqua County, NY and the Corridor K region) in Volume 2. These documents indicate that this economic growth path depends on having some combination of: (1) desirable climate, (2) interesting water, mountain or other scenery features, (3) interesting cultural, creative or recreational visitation sites and (4) access to a nearby population market for day trips. In the case of some large regional or national draws, it may also depend on (5) highway and airport for long-distance trips.

Unfortunately, there is no good database that can identify the locations of man-made sites of interest, and particularly places where there is a potential for future development of cultural, creative or recreational attractions (factor #3 above). However, it is still possible to obtain or derive data relating to factors #1-2 and #4-5 above, and those factors lead to the following diagnostic indicators:

- *Climate Rating* – Composite ratings of outdoor temperature comfort levels can be used as a factor affecting the potential for outdoor activities including tourism and recreation. This information can be drawn from NOAA data on temperature conditions in weather stations across the country, covering all states and metropolitan areas. For each location, their database provides monthly data on temperature averages and ranges, as well as heating and cooling "degree-days" (indicators of comfort levels for outdoor activities and

need/cost of running heaters and air conditioners if indoors). This database has now been assembled for potential use in LEAP.

- *Physical Amenity Rating* – Composite ratings of physical amenities can be used to represent the attraction of an area as a place to live. The ERS-USDA "Natural Amenities Scale" is an index reflecting the extent to which each county offers topographic variation (hills and mountains) and water areas (lakes, rivers and seacoasts), as well as temperate weather and low humidity. It is provided by the Economic Research Service (ERS) of the US Dept. of Agriculture (USDA). This dataset was obtained and used in the Volume 3, Chapter 5 study by MIT, though that use was in the context of predicting economic distress (where it was not a significant explanatory factor) rather than the context of assessing amenity-based tourism and retirement activities (where it would be a much more relevant factor). It is now available for potential use in LEAP.

- *Major Highway Access* – Good highway access is needed for development of most tourism and visitor attraction sites. This can be measured in terms of distance from the county population-weighted center to the nearest four-lane or interstate level highway. That is the same measure discussed earlier for evaluation of supply chain growth potentials.

- *Urban Rating* – Urbanized areas could provide a larger density of population and higher likelihood of multiple attractions for some types of day-trip tourism. Degrees of urbanization can be measured in terms of the ERS/USDA "Rural-Urban Continuum Codes" -- a classification scheme of nine steps that distinguishes metropolitan counties by population size and non-metropolitan counties by degree of urbanization and adjacency to metropolitan areas. The urbanization measure was used in the Volume 3 study of general spatial influence factors. However, the role of this factor particularly for tourism and amenity based development is not yet proven.

3.6 Learning and Technology Growth Paths

Learning and technology growth paths are forms of economic development that leverage the collective knowledge of specialized technologies and/or the entrepreneurial base that is embodied in the residents and workforce of a region. These features are typically the result of two factors: (1) specialized workforce training, including experience with technical applications and/or commercialization processes, and (2) strength of specialized supporting systems such as colleges, research & development facilities, financial institutions and high levels of broadband availability and usage. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with learning and technology-based ratings for both existing conditions and future potential

opportunities.

Rating Existing Learning-based Setting. A description of learning and technology-based economic growth is provided in Volume 1. It indicates that areas with this type of economic growth path are often characterized by having a larger than normal concentration of activity in supporting institutions, including graduate level higher education institutions, private research laboratories, and science-based industries (such as pharmaceuticals and computer electronics). This leads to the following proposed indicator of existing conditions:

- *Economic Base: Education, Research and Development* –This is an index reflecting the extent to which higher education institutions, research and development laboratories and science-based industries account for a higher portion of employment in the study area than the statewide average for those activities. This is reflected in a composite "Location Quotient" for education, research and technology industries.

Rating Potentials for Future Learning-Based Growth. Discussion of the determinants of learning and technology-based economies are provided in Volume 1, as well as the case study of technology development (Morgantown-Fairmont WV) in Volume 2. They indicate that key factors affecting success in learning-based economic development are: workforce training and entrepreneurship, supported by concentrations of educational institutions and research centers, availability of broadband technology, and availability of financing options. Those factors lead to the following diagnostic indicators:

- *Four Year Colleges (spatial lag)* – This measure is defined as the number of students attending four year colleges and graduate programs in the specified county and surrounding counties. It is constructed parallel to the "spatial lag" variable, defined earlier to measure local concentrations of activity that serve a broader "hinterland" region. A database listing the names and addresses of all colleges is provided by the US Dept. of Education. This measure is being processed and will soon be programmed as an addition to LEAP operations.

- *College Graduates* – This measure is defined as the portion of the active workforce in a given county that has completed at least four years of college, relative to the national average. It is derived from US Census Bureau data. The rating can also be scaled by workforce size, if desired. The basic measure has now been implemented in LEAP.

- *Broadband Access* – This measure is defined through a 0 – 4 scale reflecting the number of competing service companies offering broadband access in a given area. It is compiled from FCC and telecom/cable industry sources. The premise behind this measure is that greater availability and more competition lead to increased coverage and reduced prices compared to places where such competition is not available. This measure has now been implemented in

LEAP.

- *Entrepreneurship* – This measure reflects the fact that some areas have attracted a population base that exhibits notably higher than normal rates of entrepreneurship. This may be due to some combination of location isolation, cultural traditions, local institutions or historical factors. The Federal Reserve Bank of Kansas City has developed "Entrepreneurship Indicators" on the basis of BEA and Census data about local employment and income generated by non-farm proprietors.

3.7 Natural Resource & Other Growth Paths

There are other economic growth paths that need to be acknowledged, though we do not develop measures of their status or growth factors for reasons that are explained below.

- *Natural resource-based economic growth* is that made possible by the existence of mineral, lumber or agricultural resource assets. Historically, the American economy through the mid nineteenth century was based primarily on natural resource development, and many rural areas across America still depend on it. A problem that plagues many rural areas, but particularly rural Appalachia, is that the coal mining and lumber/wood resources that were previously the mainstay of local economies is no longer a source of job growth (while industry output has grown by investing in technology-enhancements.) Therefore, most of these areas are making attempts to diversify away from a resource-based economy. Accordingly, we do not focus heavily on natural resources among the various forms of asset-based growth in this study (the exception is the case study in Volume 2 for Pike County, KY) for the Appalachian Regional Commission.

- *Government and institution-based economic growth* is made possible by the external decision of government agencies (federal and/or state) and private institutions to site major regional or national facilities in an area. There are some notable examples of military bases, government office facilities, colleges and research labs that have chosen to locate in rural, isolated areas within Appalachia and elsewhere. Some of these decisions were made in part to help "jump-start" a local economy. However, the political, personal and institutional preference factors underlying these decisions are usually outside of local control. Hence, we do not develop measures to reflect the potential for this form of economic growth.

3.8 Supporting Local Economic Development

Use of LEAP. The Local Economic Assessment Package (LEAP) is being used by the Appalachian Regional Commission as a means of providing its Local Development Districts (LDDs) and the Appalachian state-level economic development agencies with both relevant information and diagnostic tools for improving economic development. Adding measures of the current growth path status of local areas, as well as ratings of potential opportunities for pursuing various growth paths will impart new capabilities to the LEAP analysis. Instead of just offering diagnostics and targets in terms of *industries*, it will also be capable of offering diagnostics and targets in terms of *growth paths*. By having both capabilities, ARC, the LDDs and the state agencies can be empowered to make more informed and better targeted economic development strategies for local development.

Further Research and Enhancement of Tools. The improvements laid out in this chapter are an initial attempt to expand the economic development analysis tools and assessment methods beyond the industry-based cluster targeting that has been a mainstay of the economic development field for many decades. The research discussed in Volume 1, the case studies in Volume 2 and the new empirical analysis covered in Volume 3 all point to a common conclusion -- that local economic development success comes from the confluence of many factors, and further work is clearly necessary to further untangle their roles and effects.

In particular, the work completed in those three earlier volumes also moves forward our state of knowledge and understanding of economic development growth factors. In particular, it confirms the importance of understanding "spatial linkages" – factors that tie the economic development success of an individual county or a region to the broader economic development patterns and trends of their neighbors – proximal and /or economic. That work also confirms the key role that accessibility and Appalachian transportation improvements can make in affecting all of the various economic development growth paths. As new research is completed, further improvements can be made in our diagnostic measures of growth path opportunities and targets.

4 CONCLUSIONS FROM THE STUDY OF SOURCES OF GROWTH

4.1 Lessons learned from the Comprehensive Examination

This multi-year study effort on non-metro Appalachian growth prospects combined several research techniques to examine various hypotheses on the growth processes that may be most compatible with local conditions and assets (both physical and human-made). The working hypothesis of this inquiry is that when local economic development efforts are better informed by the use of the new tools and insights about what they have to work with – including the attributes of neighboring communities/economies – such efforts will yield better suited opportunities for growth than when planned in isolation.

That being said, it is not always transparent to even local economic developers what the explanation is for one rural county's success story. Even if that evidence can be articulated retrospectively, it is likely that the perspectives would differ in terms of the identifying the most critical factor(s) to the economic turnaround and in the sequence of socio-economic/policy events – whether local, regional, national or global.

4.2 Lessons from the Case Studies

In the few instances where case study results did not entirely agree with the expected model generated patterns of growth, we gained a new understanding of how neighboring economies' spatial influence exert adverse backwash effects on the case study economies (such as the influence of the Cincinnati metro area on the development path of Scioto County, OH). In essence we learned about the limitations of the spatial economic base modeling diagnostics and reinforced the validity of findings from other research, such as by Feser (2005). This discovery process added another dimension to our understanding of the processes influencing the current and desired economic performance in non-metro Appalachia. In short, while timing and

patience are key features of every strategy plan, and its associated outcomes, these results underscore the need for a periodic reassessment of how the local economy and labor market are changing in relation to neighboring economies. Market access opportunities are rarely evenly distributed which makes it all the more imperative to (a) improve what you can, and then with the remaining access limitations (b) plan regionally so that the growth opportunities that have emerged for one county (e.g. Pike County, KY) may exert more of a beneficial spillover to distressed, neighboring counties.

Engaging the educational system – from K-12 to leveraging certificate programs and community colleges – has to be one of the first steps to re-conditioning the existing workforce and preparing the county's future working age residents for meeting regional employment demand – especially if job growth is slow to ignite in the home county. This also requires that the workforce has access to the transport infrastructure to connect to the employment center. This evolution of events was most clearly demonstrated in the case of Alabama's success in building its current auto assembly cluster.

Both the educational resources and transportation infrastructure of a county can evolve to take on more dynamic roles to shaping local and regional growth outcomes. As the case of the Morgantown-Fairmont high-tech development demonstrated, the R&D investment and population that are drawn to locations with higher-education institutions and government research facilities are rewarded with broader networks (e.g. social capital), commercialization of research, business start-ups, and opportunities for higher wage job formation. These are the benefits conferred on learning-based economies.

In addition to Alabama's responsive educational system, auto assembly manufacturing took hold throughout the state as a result of plentiful development sites (many as greenfields and flat terrain) and the fact that Alabama's ample highway network allowed in-state auto manufacturing firms to participate in several national supply chains as well.

4.3 Key Findings from Empirical Studies

These studies shed new light on what causes some non-metro Appalachian counties to make economic strides forward, while others remain distressed. Key objectives of these studies were an examination of the role of economic linkages among counties, and the effects of demographic factors, industry mix, mountain topography, market access and highway improvements, among other factors, in affecting relative economic performance. Of particular note is the exploration of new techniques to examine spatial and economic linkages in a region to help diagnose complementary development prospects for the economic base of neighboring counties. Another contribution is the empirical study of the economic development impact of the ADHS, which provides evidence on the significant impact of new corridors in the system, as

well as the continued importance of manufacturing in accounting for the growth differences of Appalachian counties as compared to their socioeconomic non-Appalachian twins. The set of empirical studies provide important insights into how spatial measures interact with demographic, industry, geographical and transportation variables to influence economic performance and growth rates. Taken together these findings provide better calibrated economic analytical techniques that can help to identify relevant development paths given the assets, linkages and constraints of the counties within their regional neighborhood.

Economic Base Studies:

The spatial linkage economic base model provides new tools to diagnose the economic development prospects of counties relative to their neighbors and the larger surrounding region. The principal distinction between the classical export-base model and the modified spatial model is that in the spatial model, the export-base is segmented into two components where the "local" oriented export-base is linked directly to "global" export activities in the neighboring counties. In addition, this approach introduces the concept of *regional neighborhood* which can be understood as the sphere of immediate economic influence of a county's economy exerted via common infrastructure, economic linkages, shared labor pools, etc. Because most of these effects diminish with geographical distance, it is reasonable to assume initially that most of these cross-county border interactions affect neighboring counties.

The spatial export base method provides insights into the development potentials of the distressed and transitional counties' export-base, but the methodology is perhaps best used on a regional and sub-regional basis rather than on a county basis. While this analysis can be used to create profiles for each county, highlighting the multipliers, the top industries for each county, etc., users should not construe these county profiles as policy prescriptions since by definition the profiles reflect the influences of neighboring counties. Instead this approach should be used for a cross-county comparison to understand the relative characteristics of these counties such as the degree of industry diversification or concentration, or the regional linkages. This application may be useful in identifying potential "growth hubs" that possess strong spatial and economic linkages with their neighbors and the potential to generate regional growth, but caution is recommended given important data and modeling limitations as evidenced by the case study of Scioto County, OH in Volume 2. Moreover, this model has analytical limitations in applications to remote, rural counties. In this context it is recommended that this method be applied to groups of counties for case studies that examine the spatial forces at work on each county in a specific neighborhood.

Transportation Access Studies: Several facets of these studies examine the impact of different types of transportation accessibility in affecting the economic performance and prospects of counties.

The Impact of the ADHS: The key empirical finding of twin county study on the impact of ADHS is that by 2000, the performance of ARC counties with open ADHS segments had higher income growth relative to their non-Appalachian twins, with the ADHS counties posting 200% more income growth over the 1969-2000 period. This finding can be compared to the growth rate gap between all ARC counties and their twins. By 2000 income in all ARC counties had grown 131% more since 1969 than in the non-Appalachian counties; earnings growth was 96% higher; population growth was 9% higher; and per capita income growth was 36% higher. Thus, this study showed that using survey-based data overcame shortcomings in earlier analyses to demonstrate a robust statistical link between ADHS investments and differential income and earnings growth between ARC counties and their twins, particularly for new construction. These findings also suggest that there is a considerable lag between highway investments and their full effect on economic growth.

The twin county study also provides insight into the uneven performance in the ARC region during this period: performance in the northern part of the ARC region not only lagged its non-Appalachian twins but also the rest of Appalachia, and smaller metropolitan areas fell far behind their non-Appalachian counterparts. By contrast, the study of long-term trends also showed that the states performing best relative to their non-Appalachian "twins" (i.e., Georgia, Kentucky, and South Carolina, and Tennessee) appeared to do so in part on the strength of their performances in manufacturing. This reinforces the finding that manufacturing clusters are still an important source of economic growth.

Airport Accessibility: This study found that there are the types of industries that can be expected to situate near airports because they rely on business air travel for meetings with either clients or other office locations of their business. Businesses that appear to particularly value reductions in travel time to airports include wholesale trade, paper manufacturing, insurance, and professional services. While these findings on airport access make sense, there is need for further analysis of the business attraction relationship to airport access – separating improvements in access time, distance, type of highway access and/or airport service levels. Furthermore, there is a need to further explore the ways in which market scale and airport access may be better measured by industry employment shares, concentration ratios or total size of the industries.

Demographic and Spatial Influences on County Economic Performance: These econometric studies provide new insights into how spatial influences interact with demographic, industry, geographical and transportation attributes of a county to influence its economic performance and rate of growth. First, the studies demonstrated the importance of explicitly modeling spatial dependencies among counties in order to avoid overstating the influence of other non-geographical factors that account for growth differences within the Region. In addition, using adjacency to measure spatial dependency may not be the best way to account for spatial spillover effects among counties, particularly knowledge-based spillovers such as the diffusion of information, innovations, and technical collaboration which are not as simply contained by adjacency.

Second, the analyses confirm the importance of other measures of connectivity and interdependence, particularly major highway and rail infrastructure connecting the localities to population centers or resource users. Work force accessibility as measured by commuting times vary in their impact on economic performance according to county types, with commuter accessibility mattering most for micropolitan counties, registering as somewhat important for Metro counties, and as not significant for non-core, non-metro counties. With respect to geographical factors, the most salient finding is that metro areas' economic performance are least influenced by geography (the result of infrastructure and population-economic density having diluted the constraints of topography). In contrast non-metro areas, particularly non-core counties with neighboring counties that have relatively more rugged terrain, may benefit economically from accessibility improvements as shown in the case study in Volume 2 of Pike County, KY as a trade center, and Cherokee County (Murphy, NC) as a trade center in the Corridor K region.

Third, rather than trying to identify a single, complex model for explaining economic performance and growth differences across all county types, a potentially more useful inquiry was to identify the most relevant type of model for a county depending upon the characteristics of that county and its neighbors. Indeed, while the results from the general models developed in this report underscored the relevance of spatial modeling, the findings also indicate the need to disaggregate counties into metro, micropolitan and non-core, non-metro types.

Once the cross sectional analysis was disaggregated by county type, the separate analyses demonstrated that metro, micropolitan and non-core counties exhibit considerable variation in economic performance and growth, with varying responses to demographic, industrial, geographic and transportation accessibility factors. Yet, analyses based on county types pose new challenges in modeling spatial relationships, as the researchers indicated, and leave open to question certain findings since spillover effects are not being explicitly modeled, particularly for demographic variables such as educational attainment (which are probably considerable for micropolitan counties). The finding of the positive employment growth effect of industry concentration within the micropolitan county makes intuitive sense in that it may reflect the influence of cluster-type development, while the negative employment effects of industry

concentration in non-core, non-metro counties undoubtedly reflects the effect of a narrow economic base due to the high dependence on one industry. The lack of influence of industry concentration in metro counties follows from the higher diversification of the economies of such counties. Nevertheless, the findings on industry mix (based on factor analysis) raise more questions than they answer, and clearly require more exploration, as do the specifications of these models which lack explanatory power, particularly for explaining employment growth in micropolitan and non-core, non-metro counties.

Fourth, a few conundrums were uncovered by these analyses, particularly the lack of explanatory power of natural amenities to account for economic performance differences based on the natural assets of the counties. The lack of explanatory power for natural amenities suggest the need for other types of spatial modeling, perhaps based on transportation networks and improvements between metro and non-metro counties. Since the presence of natural amenities is largely invariant over time, it makes sense to model relevant changes in infrastructure that may affect the accessibility or value of these assets to the non-resident population. The influence of knowledge-based spillovers may require an understanding of networks that link, for example, higher education institutions with research and industry centers.

Fifth, entrepreneurial measures performed reasonably well in the economic health models indicating that increases in *income per non-farm proprietor* were positively correlated with lower distress levels, while an increase in dependence on *proprietors' income relative to wage and salary income* were correlated with increased distress. These results seem to reflect the differences stemming from greater entrepreneurial opportunities in counties where proprietors income in growing, while increases in proprietors income relative to wage and salary incomes suggests *entrepreneurship of necessity* due to a lack of wage and salary employment growth.

Finally, a separate analysis of the relationship of the size of the population base on the business mix of a county shows that population thresholds matter, particularly for transportation, financial services, publishing, professional and technical services, and real estate. These findings are useful in framing and targeting local strategies for both business recruitment and entrepreneurial strategies that non-metro counties might pursue.

4.4 Implementing Findings for Strategy Planning

Many of these modeling findings provide an analytical foundation for applying better calibrated economic techniques to identify relevant development paths given the assets, linkages and constraints of the counties within their regional neighborhood. Counties in micropolitan areas, and perhaps those adjacent to micropolitan areas or

linked via major transportation corridors and supplier chains, should be viewed as the prime candidates for applying many of these techniques and insights. Many of the growth factors that were identified in the various facets of this study are amenable to further refinements by augmenting the diagnostic capabilities of the EDR-LEAP model which is available to all local development district entities as an on-line research tool. Many of the growth path specific attributes are already now implemented in the EDR_LEAP tool and the current market access logic of EDR-LEAP implicitly begins to address spatial linkage potential, though this could be done with greater detail as the data resources become available. Having evolved from the first ARC-*Highway Opportunities* model, the EDR –LEAP model is an accessible economic development analysis framework that accounts for the role of overcoming market isolation and points towards different opportunities for an area's working age residents and businesses. The result of including better understood metrics that depict the spatial influences exerted on a county, or its growth path propensity would seem promising to improve how opportunities are both understood and identified. There may be opportunities to complement such applications with additional case study work that applies spatial econometric analysis and regional input-output analysis to better explicate the nature of these spatial relationships among non-metro counties and the implications on how economic activity is organized.

4.5 Future Study Directions on Non-metro Growth Processes

The following areas have emerged for future study as a result of where this current research effort has concluded. The impact analysis of the ADHS suggests the need for more detailed examination of the time lags between the completion of corridors and the economic impacts, including applying spatial analysis to assess any backwash or relocation effects. The augmented export base model could be revisited to improve the level of resolution regarding the nature of cross-sector interactions under-pinning the spatial linkages currently detected. Further spatial modeling techniques should be developed to explore the spillover effects for different county types, as well as developing new spatial modeling approaches for amenity and knowledge-based spillovers. Finally, nowhere in the current study undertaking was the role of fiscal capacity in growth outcomes explored. To do so will require overcoming the current data constraints and harnessing a good cross-section of fiscal data.