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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 (<i>Number of firms</i>)	Dense, Sparse
Breadth (<i>horizontally related industries</i>)	Broad, Narrow
Activity Base (<i>activities in the value-added chain</i>)	Activity-Rich, Activity-Poor
Depth (<i>Range of vertically-related industries</i>)	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 (<i>Ability to generate key innovation relevant to competitive advantage</i>)	High Innovation, Low Innovation
Ownership Structure	Local, National, Foreign
Industrial Organization (<i>Governance structures and relationships among firms</i>)	“All Ring - No Core”, “All Core - No Ring”, “Core-Ring with coordinating or leading firm
Co-Ordination Mechanisms (<i>Organization of inter-firm relationships</i>)	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.

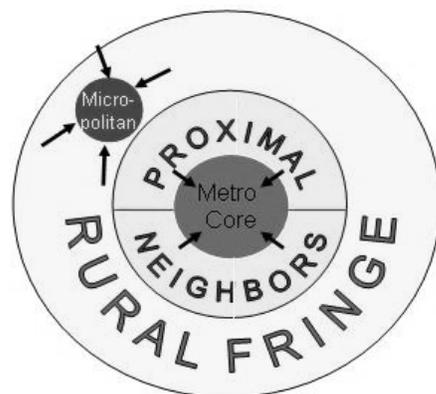
If we adopt this broad research-oriented concept of clusters, then it becomes clear that all of the growth paths examined in this study are variant forms of clusters. That includes trade centers, industry agglomerations, supply chains and dispersal economies, resource-dependent growth, and asset-based 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

Description	United States			Appalachia		
	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.

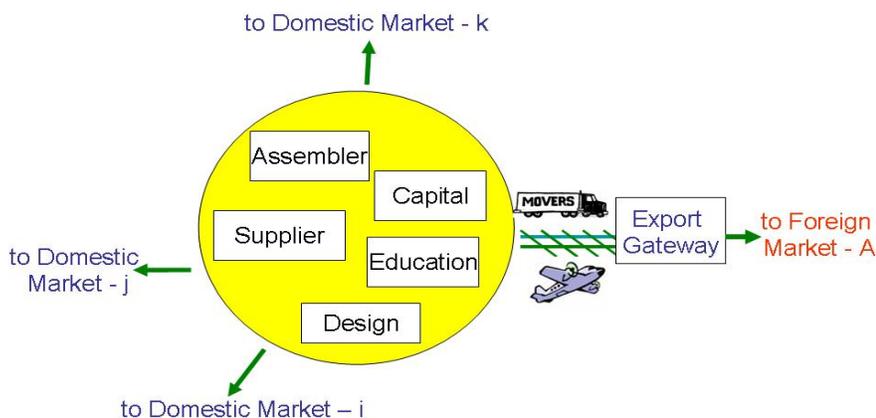
(A) Overview of Industry Clusters. An industry agglomeration cluster is a group of business enterprises and non-business organizations that benefit from belonging to the cluster by increasing their individual competitiveness. Binding the cluster together are “buyer-supplier relationships, or common technologies, 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 <i>(Agglomeration)</i>	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 <i>(Collective Efficiency)</i>	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 cluster 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

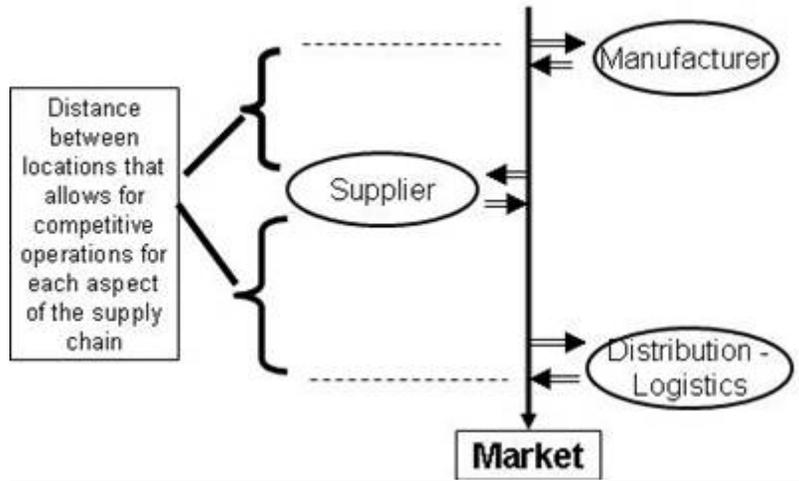
Supply Chain Development– Economic growth based on the development of businesses that are dispersed across a large distance but accessible to a single transportation corridor. This is typically a concentration of assembly, parts and distribution activities supporting a common set of industries. This 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

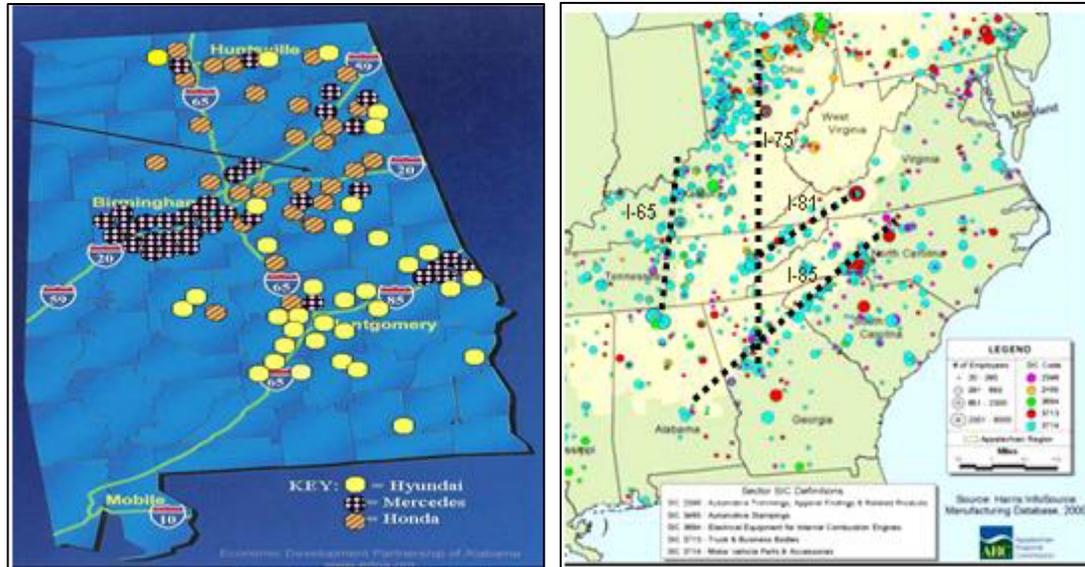
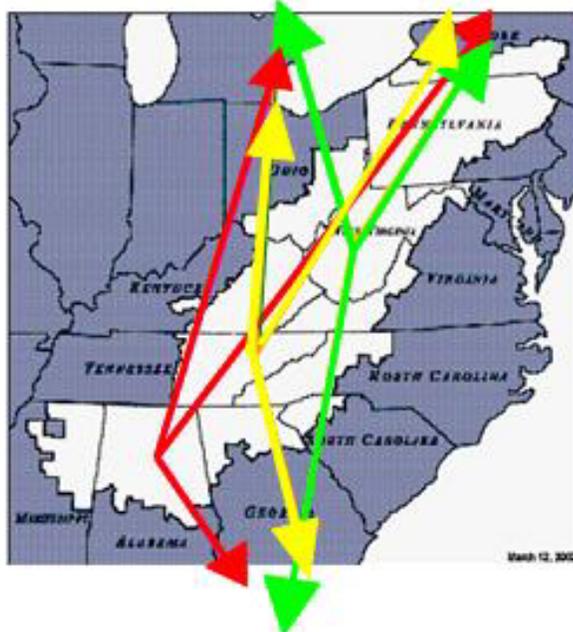


Exhibit 2-10 Major Flows of Auto Parts Exports from Appalachia

(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 some 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 Virginia-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 fundamental 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 how 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 contrast 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 through 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

<i>Mechanism</i>	<i>Units of Analysis</i>	<i>Form</i>	<i>Constraints</i>
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 from 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.

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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 case 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.