3 USE OF FINDINGS FROM SOURCES OF GROWTH PROJECT

3.1 Enhancing Analytic Capabilities

The *Sources of Growth* project provided a synthesis of theory and prior research on growth paths, a day-long workshop of experts in the field, and empirical studies of factors affecting economic growth in Appalachia. As summarized in the prior three volumes, these efforts highlighted critical considerations in defining alternative growth paths and their determinants. That has enabled us to identify ways in which LEAP tools can be improved to better serve the needs of Appalachian LDDs and State Economic Development Agencies. These improvements fall into three categories:

- **Defining Growth Paths.** Until now, LEAP has focused on evaluating and identifying appropriate *target industries* for local areas. However, the research conducted for this study suggests that there can be additional value in explicitly identifying classes of *target growth paths* (rather than just target industries) that local areas can pursue in their economic development strategies. An example of such a classification is shown in Exhibit 3-1.

- **Rating Existing Situation.** Until now, LEAP has focused on characterizing existing conditions through *ratings of local economic performance* and trends. However, the research conducted for this study enables us to also develop *ratings of localized growth specialization*. Such ratings can reflect the extent to which a local area is already specializing as a resource-based, learning-based, tourism-based, supply-chain based or trade center based economy.

- **Rating Potentials for Alternative Growth Paths.** Until now, LEAP has focused on recommendations of economic growth opportunities in terms of *potential industries*. However, the research conducted for this study provides us with a further capability for recommending *potential growth path directions* based on potential competitive advantages such as labor skills, road networks, climate or technology infrastructure features.

Exhibit 3-1. Definition of Six Major Classes of Economic Growth Paths

Basis for Area's Economy Growth	Description
Trade Center	Growth pattern emanating from a small urban cluster that provides goods and services to the exurban communities & rural hinterlands
Agglomeration (*e.g.* cluster economy)	Growth resulting from geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries.
Supply-Chain (*e.g.* dispersal economy)	Remote location is chosen over the central metropolitan area to host a node of economic activity (distribution or assembly) that is part of a larger (geographic) production chain.
Natural Amenity or Cultural Assets	Growth as a result of either quality-of-place attracting new households –or – efforts to actively develop & promote cultural, recreation, eco-tourism venues and their supporting visitor services.
Knowledge (Learning) Assets	Growth opportunities leveraged from the collective knowledge embodied in the region, including social capital, technical applications / commercialization, institutional assets (educational and financial), entrepreneurial start-ups.
Other Growth Paths: Natural Resources and Government	Growth made possible by the existence of long-standing mineral, lumber or agricultural resources, or by the decision of government agencies to site major regional or national facilities in an area.

The remainder of this chapter describes various measures that can be constructed to assess the current growth path status of an area or the factors affecting local potential for various growth paths. The measures that are listed and discussed in the rest of this chapter are not intended to represent a complete list of desired or possible metrics. Rather, they are intended to represent what is known to be currently possible given (a) publicly available data sources and (b) proven metrics that have been demonstrated in the literature of prior studies (described in Volume 1) or recent empirical studies (described in Volume 3).

These various measures represent potential additions to enhance the value and use of LEAP for assessing growth path opportunities. At the time of this report's publication, some have been implemented, some are planned for implementation in the near future and others are still in the proposal or development process. Updates on the status of these changes will be posted for participating registered users of the LEAP system, including Appalachian Local Development Districts and Appalachian State Economic Development Agencies at www.edr-leap.com ..

3.2 Trade Center Development Paths

A micropolitan trade center provides goods and services to a surrounding rural "hinterland." It depends on having a small but critical base of population and employment, a nature junction of traffic routes serving surrounding areas, and distance or topographical features that encourage residents and employees in those surrounding areas to visit this trade center location rather than other adjacent or nearby areas as their center for buying retail goods and consumer services. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with trade center indicators rating for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of trade center-based economies is provided in Volume 1. It indicates that a trade center is characterized by having a larger than normal concentration of retail stores and consumer and professional services (barbers, doctors, loan companies) than would be expected, given its population base. Of course, a given area may be a strong trade center that is well-serving a large surrounding area, or it may be a weak trade center that only partially services outside areas. This leads to the following proposed indicators of existing conditions:

- *Economic Base Indicator: Consumer Trade-Based Concentration* – This indicator is defined as the ratio of local employment in retail + consumer services + professional services, divided by local population.

- *Trade Center Micro/Metro Rating* – This indicator is defined as the county or place that has a high rating for the above-cited consumer-based concentration <u>and</u> is also designated by the US Census as a "metropolitan center" or "micropolitan center" on the basis of net inflows of workers coming in from surrounding counties.

Rating Potentials for Future Trade Center Growth. Discussion of the determinants of trade center-based economies are provided in Volume 1 as well as case studies in Volume 2. In addition, relevant research on economic hubs, spokes, and market area effects are described in Volume 3. These documents focus on transportation, topography and population clustering patterns that create centers of consumer trade activity serving surrounding trade areas that do not have similarly strong centers of activity. This leads to the following diagnostic indicators:

- *Economic Base: Trade Linkages*– Technically known as a "spatial lag multiplier," this measure is an indicator of the extent to which economic activity for each industry in a given county is supported by demand generated in neighboring counties. It is calculated by considering the industry mix of each county and that of neighboring counties and information on inter-industry relationships. It effectively captures situations where one county is serving as

the hub of economic activity for other surrounding counties. Details of this measure are provided in the Volume 2, Chapter 2 report where it was successfully used to explain trade center growth. It is based on work by Ismail at MIT, updating original work by Smirnov.

- *Labor Market Area (Scale)* – This is an indicator of the size of the workforce or population base that lives within a given (40, 50 or 60 minute) drive time of the population center of a county. It thus reaches into neighboring counties to calculate a "market area", which can be interpreted as an indicator of the relative size of both the labor market for any industry and the shopper customer market for retail and consumer service industries. This measure is constructed on the basis of geographic information systems and highway network drive times. It is a variant of the population base used for analysis in Volume 2, Chapter 4 of the Sources of Growth Study. This indicator is now implemented in EDR-LEAP.

- *Composite Trade Center Indicator* – This indicator combines spatial lag multipliers or trade area indicators with information on distance to the closest larger city or urban county. It is intended to overcome a problem confronting both of the preceding indicators, which is that they assume a strong central city surrounded by a rural hinterland, and can provide misleading results when there are actually multiple cities of significance in a multi-county region. For instance, the spatial lag multiplier seemed to indicate that Scioto County, OH was a strong trade center when it found economic strength in that county and evidence that residents of surrounding counties were going outside their home counties for purchasing of goods and services. However, the case study (in Volume 2, Chapter 2) found that the residents of those surrounding counties were actually shopping in extra-regional metro centers due to new highway access thereby creating an adverse backwash effect on Scioto County. By measuring the distance to next larger cities or urban counties, this error can be minimized.

3.3 Industry Agglomeration Cluster Paths

Agglomeration-based economic growth is based on development of geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries. It most often depends on achieving some form of: (a) economies of scale in operations of a single industry, or (b) economies of vertical integration associated with clustering industries that buy from and sell to each other, or (c) economies associated with several industries sharing a common skill or resource base in a given region. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with agglomeration cluster indicators rating for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of agglomeration -based economies is provided in Volume 1. It indicates that an industry agglomeration cluster is characterized by having a larger concentration of individual production-based sectors and their directly complementary sectors, relative to the rest of the economic base mix. This leads to the following proposed indicators of existing conditions

- *Economic Base: Manufacturing Concentration* – This indicator is an index reflecting the extent to which any one or more manufacturing industries have a higher concentration (location quotient) in the study area that the statewide average.

- *Economic Base: Vertical Integration of Suppliers* – This indicator is an index reflecting the extent to which the dominant manufacturing industries also have a strong relative concentration of their suppler industries within the region. That is determined by using the tables of inter-industry purchasing patterns (technology coefficients) within BEA national input-output tables. These input-output relationships are already in use within LEAP for the identification of indirect business attraction opportunities; the proposed new measure would use that information for also assessing existing industries.

Rating Potentials for Future Industry Cluster Growth. Discussion of the determinants of trade center-based economies is provided in Volume 1, along with the manufacturing case study (Alabama's auto manufacturing cluster) in Volume 2. These documents focus on the scale and density of industries, workforce skills and supporting facilities, as well as their cost and quality. This leads to the following diagnostic indicators:

- *"Effective Density" of Opportunities Rating* – This is a composite indicator of the productivity gain associated with increasing the effective density of activities reachable from a center of industrial activity. It is calculated on the basis of population based within 40 minutes of the population-weighted center of the core county, divided by the land area of the county. It effectively represents density of the county population, modified to add extra "effective density" if additional outside population is close by. This measure is based on research results of "Productivity and Metropolitan Density," by Timothy Harris and Yannis Ioannides, Tufts Univ. Dept of Economics, 2000. This measure is now implemented in LEAP.

- *Gap Analysis: Vertical Integration of Suppliers* – This is the flip side of the economic base measure cited earlier. It reflects that proportional magnitude of the gap between (a) level of local employment in suppliers to the dominant manufacturing industry, and (b) the theoretical maximum employment if all suppliers were locally present.

- *Barrier Analysis: Cost Competitiveness* – This is a composite measures of the

local cost of labor, energy and transportation inputs for each industry, relative to competing areas or other comparison areas. It is calculated using relative weights for the degree to which each industry makes use of labor, energy and transportation factors in is production process. This calculation is now implemented in LEAP.

3.4 Supply-Chain (Dispersal) Paths

Supply-chain based economic growth is based on development of suppliers and distributors strung along a highway corridor. This arrangement makes use of dispersal economies for keeping labor costs low, and it makes use of transportation connection efficiencies associated with same day delivery. In some cases, it also makes use of multi-modal delivery connections (e.g., intermodal truck-rail or truck-air connections). The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with supply chain ratings for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of supply chain economic growth is provided in Volume 1. It indicates that a supply chain-based economy is most often characterized by having a larger than normal concentration of distribution facilities and/or parts suppliers to assembly plants (e.g., metal or plastic product fabricators serving auto plants). This leads to the following proposed indicators of existing conditions

- *Economic Base: Logistics Concentration* – This is an index reflecting the extent to which warehousing/distribution, wholesaling, and trucking industries have a higher concentration in the study area that the statewide average. This is reflected in a composite "Location Quotient" for those logistics-related industries.

- *Economic Base: Fabricated Parts Suppliers* – This is an index reflecting the extent to which metal, plastic or glass fabrication industries have a higher concentration in the study area that the statewide average. This is reflected in a composite "Location Quotient" for those fabrication industries.

Rating Potentials for Future Supply Chain Growth. Discussion of the determinants of supply chain -based economies is provided in Volume 1 and the auto alley case study in Volume 2. These documents focus on the roles of labor cost, industry mix and location relative to highways, in addition to highway and connections with intermodal rail and air terminals. This leads to the following diagnostic indicators:

- *Major Highway Access* – This is constructed as a measure of distance from the county population-weighted center to the nearest four-lane or interstate level highway. Alternatively, the county's mileage of four lane highways can be

used to reflect the extent of highway access occurring in the county, as done in the "Twin County" study described in Volume 3, Chapter 3. Either way, the highway measure can be used with the measures of logistics and fabricated parts suppliers to improve the indicator of supply chain supporting activity.

- *Drive time to Commercial Airport* – This is a measure of the highway drive time from the county population-weighted center to the nearest public airport with regular commercial scheduled airline service. It is combined with information on the magnitude of service provided at that airport (measured in terms of the number of annual commercial airline takeoffs and landings), so that both airport proximity and airport size (service level) are reinforcing positive factors. This interaction reflects the new empirical analysis described in Volume 2, Chapter 4. The measure also requires a database of commercial airport facilities from the FAA, and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Drive time to Commercial Rail Intermodal Terminal* – This is a measure of the highway drive time from the county population-weighted center to the nearest freight truck-rail intermodal terminal with regularly scheduled commercial scheduled freight train service. It requires a database of commercial truck-rail intermodal interchange facilities (from USDOT) and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Drive time to Commercial Marine Port – river to sea* – This is a measure of the highway drive time from the county population-weighted center to the nearest marine (river or sea) port with regularly scheduled commercial marine ship or barge service. It requires a database of commercial marine terminals with regular service (from USDOT) and a highway network with shortest time path travel times. This has now been implemented in LEAP.

- *Labor Force Scale Rating* – This is a measure of the population or workforce living within 40 minutes drive time from the county population-weighted center. A minimum level of workforce is needed to attract warehousing, wholesaling and related logistics-related industries, as shown in Volume 3, Chapter 4. Thus this measure can be interacted with the preceding four transportation access measures to develop more refined measures of potential area attractiveness for growing supply-chain based activities t an area.

3.5 Amenity & Cultural Asset Growth Paths

Amenity and cultural assets are "*quality of place*" features that can serve to attract new households to an area for a tourist visit or as a retirement destination. The attractions can be climate, interesting mountains or water features, and/or developed cultural activities or recreation venues. The plan is to improve LEAP by providing each

county or group of counties (comprising a region or Local Development District) with amenity and cultural asset activity ratings, for both existing conditions and future potential opportunities.

Rating Existing Situation. A description of amenity and cultural asset-based economies is provided in Volume 1. It indicates that this type of growth path is characterized by a concentration of lodging, meal and/or recreation activities, serving either day visitors or overnight visitors. This leads to the following proposed indicators of existing conditions:

- *Economic Base: Lodging, Restaurants and Recreation Concentration* – This is an index reflecting the extent to which local lodging (hotel, motel and camping), meals (restaurants, bars and takeout establishments) and recreation services have a higher concentration of employment in the study area than the per capita statewide average for those activities. This is reflected in a composite "Location Quotient" for those visitor-serving industries. This has now been implemented in LEAP.

- *Housing/Population Base: Retirees* – This is an index reflecting the extent to which the local area has a higher share of population that is retired and living in the region shorter than five years. It draws information from the US Census Bureau and their Current Population Survey.

Rating Potentials for Future Amenity & Cultural Asset-Based Growth. Discussion of the determinants of amenity and cultural asset -based economies are provided in Volume 1, as well as the case study of asset-based growth (e.g Chautauqua County, NY and the Corridor K region) in Volume 2. These documents indicate that this economic growth path depends on having some combination of: (1) desirable climate, (2) interesting water, mountain or other scenery features, (3) interesting cultural, creative or recreational visitation sites and (4) access to a nearby population market for day trips. In the case of some large regional or national draws, it may also depend on (5) highway and airport for long-distance trips.

Unfortunately, there is no good database that can identify the locations of man-made sites of interest, and particularly places where there is a potential for future development of cultural, creative or recreational attractions (factor #3 above). However, it is still possible to obtain or derive data relating to factors #1-2 and #4-5 above, and those factors lead to the following diagnostic indicators:

- *Climate Rating* – Composite ratings of outdoor temperature comfort levels can be used as a factor affecting the potential for outdoor activities including tourism and recreation. This information can be drawn from NOAA data on temperature conditions in weather stations across the country, covering all states and metropolitan areas. For each location, their database provides monthly data on temperature averages and ranges, as well as heating and cooling "degree-days" (indicators of comfort levels for outdoor activities and

need/cost of running heaters and air conditioners if indoors). This database has now been assembled for potential use in LEAP.

- *Physical Amenity Rating* – Composite ratings of physical amenities can be used to represent the attraction of an area as a place to live. The ERS-USDA "Natural Amenities Scale" is an index reflecting the extent to which each county offers topographic variation (hills and mountains) and water areas (lakes, rivers and seacoasts), as well as temperate weather and low humidity. It is provided by the Economic Research Service (ERS) of the US Dept. of Agriculture (USDA). This dataset was obtained and used in the Volume 3, Chapter 5 study by MIT, though that use was in the context of predicting economic distress (where it was not a significant explanatory factor) rather than the context of assessing amenity-based tourism and retirement activities (where it would be a much more relevant factor). It is now available for potential use in LEAP.

- *Major Highway Access* – Good highway access is needed for development of most tourism and visitor attraction sites. This can be measured in terms of distance from the county population-weighted center to the nearest four-lane or interstate level highway. That is the same measure discussed earlier for evaluation of supply chain growth potentials.

- *Urban Rating* – Urbanized areas could provide a larger density of population and higher likelihood of multiple attractions for some types of day-trip tourism. Degrees of urbanization can be measured in terms of the ERS/USDA "Rural-Urban Continuum Codes" -- a classification scheme of nine steps that distinguishes metropolitan counties by population size and non-metropolitan counties by degree of urbanization and adjacency to metropolitan areas. The urbanization measure was used in the Volume 3 study of general spatial influence factors. However, the role of this factor particularly for tourism and amenity based development is not yet proven.

3.6 Learning and Technology Growth Paths

Learning and technology growth paths are forms of economic development that leverage the collective knowledge of specialized technologies and/or the entrepreneurial base that is embodied in the residents and workforce of a region. These features are typically the result of two factors: (1) specialized workforce training, including experience with technical applications and/or commercialization processes, and (2) strength of specialized supporting systems such as colleges, research & development facilities, financial institutions and high levels of broadband availability and usage. The plan is to improve LEAP by providing each county or group of counties (comprising a region or Local Development District) with learning and technology-based ratings for both existing conditions and future potential

opportunities.

Rating Existing Learning-based Setting. A description of learning and technology-based economic growth is provided in Volume 1. It indicates that areas with this type of economic growth path are often characterized by having a larger than normal concentration of activity in supporting institutions, including graduate level higher education institutions, private research laboratories, and science-based industries (such as pharmaceuticals and computer electronics). This leads to the following proposed indicator of existing conditions:

- *Economic Base: Education, Research and Development* –This is an index reflecting the extent to which higher education institutions, research and development laboratories and science-based industries account for a higher portion of employment in the study area than the statewide average for those activities. This is reflected in a composite "Location Quotient" for education, research and technology industries.

Rating Potentials for Future Learning-Based Growth. Discussion of the determinants of learning and technology-based economies are provided in Volume 1, as well as the case study of technology development (Morgantown-Fairmont WV) in Volume 2. They indicate that key factors affecting success in learning-based economic development are: workforce training and entrepreneurship, supported by concentrations of educational institutions and research centers, availability of broadband technology, and availability of financing options. Those factors lead to the following diagnostic indicators:

- *Four Year Colleges (spatial lag)* – This measure is defined as the number of students attending four year colleges and graduate programs in the specified county and surrounding counties. It is constructed parallel to the "spatial lag" variable, defined earlier to measure local concentrations of activity that serve a broader "hinterland" region. A database listing the names and addresses of all colleges is provided by the US Dept. of Education. This measure is being processed and will soon be programmed as an addition to LEAP operations.

- *College Graduates* – This measure is defined as the portion of the active workforce in a given county that has completed at least four years of college, relative to the national average. It is derived from US Census Bureau data. The rating can also be scaled by workforce size, if desired. The basic measure has now been implemented in LEAP.

- *Broadband Access* – This measure is defined through a 0 – 4 scale reflecting the number of competing service companies offering broadband access in a given area. It is compiled from FCC and telecom/cable industry sources. The premise behind this measure is that greater availability and more competition lead to increased coverage and reduced prices compared to places where such competition is not available. This measure has now been implemented in

LEAP.

- *Entrepreneurship* – This measure reflects the fact that some areas have attracted a population base that exhibits notably higher than normal rates of entrepreneurship. This may be due to some combination of location isolation, cultural traditions, local institutions or historical factors. The Federal Reserve Bank of Kansas City has developed "Entrepreneurship Indicators" on the basis of BEA and Census data about local employment and income generated by non-farm proprietors.

3.7 Natural Resource & Other Growth Paths

There are other economic growth paths that need to be acknowledged, though we do not develop measures of their status or growth factors for reasons that are explained below.

- *Natural resource-based economic growth* is that made possible by the existence of mineral, lumber or agricultural resource assets. Historically, the American economy through the mid nineteenth century was based primarily on natural resource development, and many rural areas across America still depend on it. A problem that plagues many rural areas, but particularly rural Appalachia, is that the coal mining and lumber/wood resources that were previously the mainstay of local economies is no longer a source of job growth (while industry output has grown by investing in technology-enhancements.) Therefore, most of these areas are making attempts to diversify away from a resource-based economy. Accordingly, we do not focus heavily on natural resources among the various forms of asset-based growth in this study (the exception is the case study in Volume 2 for Pike County, KY) for the Appalachian Regional Commission.

- *Government and institution-based economic growth* is made possible by the external decision of government agencies (federal and/or state) and private institutions to site major regional or national facilities in an area. There are some notable examples of military bases, government office facilities, colleges and research labs that have chosen to locate in rural, isolated areas within Appalachia and elsewhere. Some of these decisions were made in part to help "jump-start" a local economy. However, the political, personal and institutional preference factors underlying these decisions are usually outside of local control. Hence, we do not develop measures to reflect the potential for this form of economic growth.

3.8 Supporting Local Economic Development

Use of LEAP. The Local Economic Assessment Package (LEAP) is being used by the Appalachian Regional Commission as a means of providing its Local Development Districts (LDDs) and the Appalachian state-level economic development agencies with both relevant information and diagnostic tools for improving economic development. Adding measures of the current growth path status of local areas, as well as ratings of potential opportunities for pursuing various growth paths will impart new capabilities to the LEAP analysis. Instead of just offering diagnostics and targets in terms of *industries*, it will also be capable of offering diagnostics and targets in terms of *growth paths*. By having both capabilities, ARC, the LDDs and the state agencies can be empowered to make more informed and better targeted economic development strategies for local development.

Further Research and Enhancement of Tools. The improvements laid out in this chapter are an initial attempt to expand the economic development analysis tools and assessment methods beyond the industry-based cluster targeting that has been a mainstay of the economic development field for many decades. The research discussed in Volume 1, the case studies in Volume 2 and the new empirical analysis covered in Volume 3 all point to a common conclusion -- that local economic development success comes from the confluence of many factors, and further work is clearly necessary to further untangle their roles and effects.

In particular, the work completed in those three earlier volumes also moves forward our state of knowledge and understanding of economic development growth factors. In particular, it confirms the importance of understanding "spatial linkages" – factors that tie the economic development success of an individual county or a region to the broader economic development patterns and trends of their neighbors – proximal and /or economic. That work also confirms the key role that accessibility and Appalachian transportation improvements can make in affecting all of the various economic development growth paths. As new research is completed, further improvements can be made in our diagnostic measures of growth path opportunities and targets.