

THE INSTITUTE FOR ADVANCED LEARNING AND RESEARCH
PROGRAM IN THE DAN RIVER REGION OF VIRGINIA
and the New Growth economic development theory

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Major paper submitted
to the Faculty of Virginia Polytechnic Institute and State University
In partial fulfillment of the requirements for the degree of

Masters of Public and International Affairs

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January 5, 2004

Blacksburg, Virginia

Key words: economic development, rural development, new growth theory, human
capital

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ABSTRACT

This paper applies New Growth Theory (NGT) to the economic development plan of the Institute for Advanced Learning and Research (IALR) for the Dan River region. New Growth Theory is summarized into five concepts: knowledge and human capital, technology, flexible production and innovation, and the institutional environment. The IALR program demonstrates this NGT framework. The IALR program seeks to promote growth by attracting exogenous demand for innovation and high tech. Endogenously, the program plans to create an institutional support environment and human capital infrastructure. The New Growth Theory supports the IALR in developing a knowledge based economy.

However, the New Growth Theory has limitations in application for economic development. It assumes that the targeted economy has some physical and social infrastructure. The Dan River region lacks transportation infrastructure and a history of valuing higher education. The New Growth Theory assumes that using knowledge as a factor will insure against diminishing returns. However, growth from high tech is risky and uneven. The IALR program is an example of an under-educated region trying to transform its economy by using high tech. What may happen is an increased gap between the lower and higher income population, with skilled knowledge labor being recruited and the existing human capital not able to keep up with the new skill requirements. Finally, while the Dan River region has a need to work on quality of life aspects, such as living conditions, equity, the environment, health and civic infrastructure, New Growth Theory does not consider these aspects.

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The Institute for Advanced Learning and Research Program in the Dan River Region of Virginia and the New Growth economic development theory

I. Introduction

The Institute for Advanced Learning and Research (IALR) in Danville, Virginia is a collaboration of public and private sector institutions, which is led by the Virginia Polytechnic Institute and State University (Virginia Tech). The Institute was founded on the primary goal of providing advanced learning programs for the relatively economically depressed Dan River Region. The goal of advanced learning is only a piece of a broader economic development plan for the region. Virginia Tech was brought in for its technology training and research capacity. The IALR, with the leadership of Virginia Tech, will provide only part of the needed economic development change in the region. It may be able to influence political and social trends in this region, but it cannot control them. In other words, neither the role of the Institute alone nor the presence of Virginia Tech is sufficient to ensure economic development for the region. However, the IALR, with Virginia Tech as its leader, can be a catalyst for change.

New Growth Theory (NGT), a contemporary economy development theory, is applicable to the IALR program in Danville, Virginia. New Growth theory explores how knowledge, in the form of human capital and technology, can be used for economic development. The theory suggests generating knowledge and developing high tech. It assumes that development infrastructure exists and that a community has, or can develop quickly, endogenous capacity for rapid innovative growth. The theory assumes that basic physical and social infrastructure is already in place. Although the theory argues that using knowledge and high tech will generate growth, it is vague on how actually to do

so. Using the case of the IALR, this paper asks what would need to occur in order actually to use New Growth Theory in an economic development plan.

For this paper New Growth Theory is considered under three topical areas: knowledge and human capital; technology, innovation and flexibility; and the institutional environment. New Growth Theory (NGT) is exemplified in the IALR strategic goals. Since economic growth can be generated by factor manipulation, especially the factors of human capital and technology, the institutions and the environmental milieu which nurture the accumulation of human capital and the use of technology are relevant for NGT economic development planning. First, NGT recommends using knowledge as a factor in economic growth, especially by generating human capital. Using knowledge as a factor ensures that the Dan River regional economy will not slump into a situation of diminishing returns as it historically did while a textile/manufacturing center. The IALR plans to educate and train endogenous labor in order to accumulate knowledge-based human capital. It is pursuing a high tech sector development strategy rather than seeking to recruit textile or manufacturing firms. Second, the theory suggests that intentional investment in technology is necessary. This intervention ensures ongoing innovation and the use of flexible production. At this stage the IALR has invested in a high tech research facility and high-speed communication network infrastructure. It is also trying to establish specialized research centers. All of which could evolve into a research park that would make use of innovation and methods of flexible production. Third, the theory emphasizes that the institutional environment of a region is an integral part of its economic growth. In this case, Virginia Tech, a land-grant university has been a key knowledge institution. Potentially it could act as a

magnet for other knowledge institutions to be drawn to the region. It will also participate in creating a milieu for knowledge transfer.

While these NGT strategies have the potential to help the rural economy of the Dan River region to grow, they also have the potential of separating the existing community from the advantages of rapid economic development growth. A Dan River region economic development program could expand upon NGT by nurturing qualitative rather than just quantitative aspects of social and economic change. In a practical sense, the Dan River region has had to work out when to develop which parts of its strategy. Should high tech be recruited or should the endogenous population be trained in advanced technology first? Can an endogenous population with no history of high tech be retrained in a timeframe to meet rapid high tech growth or will an exogenous population need to be recruited? If an exogenous population is recruited with the endogenous population ever be able to compete for high tech jobs in its own regional economy? Although NGT promises unlimited returns, it does not provide a clear-cut strategy by which to realize its ends.

This paper analyzes how NGT tenets have been implemented in a practical case. The first section provides an overview of the IALR program and a summary of the economic status of the region that the IALR is targeting – the Dan River region. The second section reviews the literature on New Growth Theory framed by the three concepts noted above. The third section applies NGT concepts to the IALR program. New Growth Theory concepts of mobilization of knowledge and human capital; technology, innovation and flexibility; and the institutional environment are all seen in the IALR economic development program for the Dan River region. The fourth section

of the paper discusses how quality of life attributes, such as living space, equity, environment, health and leadership are not addressed adequately by New Growth Theory. A broader Dan River region economic development program should consider these aspects. The final section concludes with a discussion of what the IALR case demonstrates about NGT and what can be learned from this analysis.

II. Literature Review: New Growth Theory

A. Using knowledge as a factor

How does economic development occur? In practice a range of specific factors determine economic growth. In neoclassical economic development theories the factors most often considered as engines of economic development include capital, labor and natural resources. New Growth Theory expands upon neoclassical theory by adding the factor of knowledge to this trio. Knowledge affects labor when the workforce develops high tech skills and capacities and an innovative mindset. Using knowledge as a factor can counteract the force of diminishing returns in mass production. Unlike capital or labor, technology knowledge does not suffer from diminishing returns, therefore its potential economic development effect is unlimited (Cortright, 2001).

Therefore, new economic development seeks to use knowledge to achieve unlimited returns. From the traditional model that predicted diminishing returns, New Growth Theory represents an evolutionary step to an equilibrium model that predicts unlimited returns. In an equilibrium model of endogenous technological change Paul Romer specifies an economic model for “long-run growth in which knowledge is assumed to be an input in production that has increasing marginal productivity” (Romer, 1986). The knowledge factor thus mitigates the prediction of diminishing returns on... in the neoclassical equilibrium model. Furthermore, long-run growth is an *intentional* result of “the accumulation of knowledge by forward-looking, profit maximizing agents” (Romer, 1986, p. 1003). Romer claims “that technological change provides the incentive for continued capital accumulation and together capital accumulation and technological change account for much of the increase in output per hour worked” (Romer, 1986, p.

S72). He divides the knowledge factor into two components, human capital and technology, and argues that intentionally manipulating the two can sustain economic growth.

B. Human Capital

Human capital theory claims that regional accumulation of human knowledge is positively related to economic growth. Romer (1990) defines “human capital”, using classical economic thought, as years of education or training that are person-specific. Human capital is the accumulated knowledge of people in a particular economy. Paul Krugman (1996) has suggested that economies grow because of core competencies, which could require, as in the New England area, for example, having a core group of talented and educated people. For human capital to affect economic growth positively, the designated population should have a knowledge base that can be turned into profit-making production.

Building human capital implies educating the population. A region does not become an innovator until its labor is educated and skilled (Malizia & Feser, 1999). The result of increased human capital is a positive regional impact on business productivity (Luger & Goldstein, 1997). Luger and Goldstein (1997) argue that from “a regional development perspective, there is no single more important ingredient for sustained economic development than a supply of creative, talented, and well-trained people”.

Simply having a large population will not necessarily lead to economic growth. Rather than population size, the quality of human capital is what influences competitive economic growth. Gottlieb (2002) studied US metropolitan areas to examine the question of whether economic development can occur by increasing per capita income

without expanding population. He determined that areas with high-tech sectors have high per capita income growth along with low population growth. Simply having a large population will not lead to economic growth. Instead the population needs to develop high tech skills. Romer (1990) comments that the fraction of human capital devoted to research is higher now than at any time in the past and that the fraction of human capital that is devoted to research, is apparently higher in the most developed countries in the world. Having a large population may result in negative externalities rather than economic growth. Instead of attracting population, an economy should pursue a strategy of developing high tech capacity, especially research skills, in its human capital.

Assuming that human capital does generate economic growth, Richard Florida (2002b) has explored how human capital can be accumulated. He has suggested two postulates for human capital accumulation. First, a region can develop human capital endogenously by educating its workforce. Second, a region can attract human capital exogenously by creating an environment with favorable incentives for relocation. A favorable environment, according to Florida includes, among other aspects, diversity in the cultural environment and the job market and a vibrant quality of life. Romer (1990) also comments on how to affect human capital accumulation. Since the value of human capital is higher than the market wage, there is a shortage (Romer, 1990). Thus, “for a government that cannot affect the allocation of human capital between sectors” such as the former USSR, Romer recommends that government subsidize research and the production of human capital (Romer, 1990, p. S97). Economic growth requires intentional intervention to generate human capital accumulation.

C. High Tech

How can the role of high tech in economic development be conceptualized? Markusen, et. al. (1986) has conceptualized high tech as the capacity of technical product sophistication or rate of employment growth in a sector (assuming high growth would mean high tech) or research and development expenditures as a percentage of sales. Each of these has operational flaws. Instead, Markusen and his colleagues based their definition on the “human capital embodied in an industry, in the form of high concentration of skilled scientists, engineers and technicians” (Markusen, Hall, & Glasmeier, 1986, p. 6). Those industries with a higher concentration than manufacturing had of this type of labor were considered high tech. The accumulation of human capital, conceptualized as the number of people in high tech employment, has been used to conceptualize high tech. This definition assumes that this type of human capital is producing profit-making results – that research is being turned into marketable products.

High tech sector development is strongly linked with economic development. High tech generates astonishing rates of growth (Markusen et al., 1986). High tech propels the economy four times faster than the overall economy (Cortright & Mayer, 2001). Since the high tech sector grows far faster than the overall economy, developing it is seen as one way to expand an economy rapidly. However, in their mid-1970s data-based analysis, Markusen, Hall and Glasmeier found a wide divergence in high tech job growth. High tech job growth in some industries saw exponential growth while others experienced absolute decline. Thus, in high tech industries more jobs are gained and lost than was the case in manufacturing. Although high tech has the allure of exponential growth and wage increase it also has the risk of rapid employment loss.

D. Innovation and Flexible Production

What enables an economy to sustain growth? Neoclassical theory suggests that the market will automatically reach equilibrium as the result of individuals acting to maximize their benefits. However, Paul Krugman (1999) frames his economic analysis with the idea that economics is not about achieving equilibrium but more about constant evolution. Achieving economic growth may not be so much about individuals maximizing gains, but about systems searching for alternatives to find the best local or global alternative (Krugman, 1999). Furthermore, in a speech Paul Krugman (1999) claimed that it is necessary “to think of the economy as having at least vaguely "evolutionary" dynamics, in which initial conditions and accidents along the way may determine where you end up.” Rather than individual actions, history may be create conditions that later structure outcomes. . How the initial arbitrary layout of the typewriter keyboard became the standard is an example of how one decision can create path divergence and shape an evolutionary economic development path (Cortright, 2001; Krugman, 1991). Other researchers (Piore & Sabel, 1984) have recognized that uncertainty is inherent in the global economy. Neither the government nor private firms can effectively predict the future economy. Piore and Sabel (1984) conceptualized a model of technological change built on the assumption that there is no “natural path” to economic success. In their model, ”the triumph of a technological breakthrough over competing adaptations depends on its timing and the resources available to its champions – rather than its intrinsic superiority” (Piore & Sabel, 1984, p. 15). Therefore, flexible production and innovation are crucial to staying competitive. Economic development could be a result of having the technology infrastructure to benefit from historical events

by being prepared with the solution before there is a demand for the new product it would support. An economy needs constantly to innovate new products and to use flexible production methods in order to change the manufacturing of its current products rapidly when the global economy shifts.

During Fordism, efficiency was determined by how effectively a specialized product was produced. However, in a rapidly changing global environment, instead of producing the same product more efficiently, the manufacturing process has to be set up to change production methods rapidly. Flexible production means that efficiency is determined by how rapidly production can be adapted to meet changing needs/demands . Innovation extends to production methods as well as new products (Florida, 2002b, p.52). In order to enable an economy to stay competitive flexible production theories suggest these actions:

1. Coordinate formal mechanisms for information and technology transfer
2. Identify barriers to new technology adoption
3. Build local industrial clusters by targeting businesses in the area (Malizia & Feser, 1999)

Flexible production becomes the supportive innovative environment around which high tech firms cluster.

An industrial cluster occurs when firms which specialize in a sector locate in geographic proximity. Specific sector specialization is one of the strengths of clusters. In a Brookings Institution study concerning US high tech development, Cortright and Mayer (2001) determined that each high tech area specialized in a few products or technologies. The 14 targeted metropolitan areas specialized in a certain type of high tech. The Washington DC and North Carolina Research Triangle areas, for example, had higher levels of biotechnology employment than other US regions (Cortright & Mayer,

2001). Clustering gives firms flexibility because they can use each other's networks. Firms in clusters gain from the presence of related organizations, for example; a nearby research university (Malizia & Feser, 1999). In his analysis of industrial theory, Harrison (1992) emphasized the beneficial behaviors that evolve as a result of the interdependence and trust which occurs by being in proximity and personal contact. High tech firms are more competitive when they cluster because they share each others' resource network.

Since clustering increases competitiveness, those interested in fostering a developing economy need to ask where and why clusters are formed. Researchers have found that high tech tends to cluster in certain regions. In the US, it tends to locate in and near certain geographic areas rather than being widely dispersed. In a 1970s study Virginia was not identified as a core US area for high tech. More recently, the Washington DC metropolitan area and the North Carolina research triangle region have been identified as having an agglomeration of high tech firms (Cortright & Mayer, 2001). High tech industries have taken advantage of agglomeration economies by clustering in proximity to other innovative high tech firms. Although there is a tendency for high tech industries to disperse once they establish themselves by initially locating within a cluster, they do tend to disperse within a region rather than across regions (Markusen et al., 1986). Thus, although literature does not support starting a high tech sector cluster where a previous cluster has not existed, a non-tech region in proximity to other high tech regions could attract high tech dispersal.

Markusen et. al. (1986) asked what strategies or factors would enable an economy without a historical high tech sector to develop one. They considered that labor is mobile so it will move to where the jobs are. Using location theory they surmised that

high tech will be drawn to “areas that are attractive to scarce, highly skilled professional and managerial talent or to areas that offer a pool of weakly organized, poorly paid assembly workers.” What they found in their research was a correlation to the business climate and scientific research. High tech industries “will . . . cluster in areas that offer a well-developed industrial infrastructure of transportation facilities and business services” (Markusen et al., 1986, p. 5). Also, because of its need for continual innovation, high tech should be drawn to areas with a research base. They concluded that high tech locates near good amenities (climate, housing prices and education options), accessibility (highway and business airport travel) and agglomeration economies. If a region desires to establish a high tech sector where none has existed it needs to develop an infrastructure to support technology used by private industry (Tassey, 1991). All of these factors can be found in a research park.

Setting up a research park takes advantage of Malizia and Feser’s (1999) flexible production strategy. According to the product life cycle, new products and industries arise from technology innovation. There has been a historical change from government funding R&D to a market demand for a technology base that demands R & D (Tassey, 1991). While the private sector has long funded R&D, it is funding more projects that only the government used to fund. In the 1990s, communities adapted to collaborations between private and public institutions at earlier stages of research and development. This form of partnership creates research parks that are designed to be innovative and to use flexible production. By collaborating , private and public institutions take advantage of economies of scale by sharing funding responsibilities, facilities and human research skills.

Research parks have been established as collaborations between the public and private sectors. In 1991 Luger and Goldstein (1991) conducted an analytical study of US high tech sector research parks. Their initial research review suggested that the following characteristics would be necessary for regions to have successful research parks:

1. an existing base of R&D and high tech
2. good air service
3. a well developed network of infrastructure and business services
4. forward looking-public and private leadership

But their study results refuted these traditional expectations. Instead, they determined that it is increasingly difficult for new research parks to succeed. Although research parks have the potential to generate growth in a region, their success is not assured.. “The expected failure rate for research parks is high (50% of startups fail and 50% of surviving parks change their focus.)“ (Luger & Goldstein, 1991, p. 181). At the time of the studies (1991) the demand for research was slowing. They concluded that un-established research efforts tend to prefer the stability of established research places. They implied that the US could not support more research parks. Research parks are less likely to succeed if they are not close to a university and in a sizable region. However, the factors working against success may be mitigated by good leadership, good luck and good planning.

E. Institutional environment and an innovative milieu

Developing a milieu is critical for ensuring that the benefits of economic growth remain within the regional economy. An innovative milieu is a broad and elusive concept. In figurative terms it represents the soil which, when the seed of knowledge falls on it, germinates into profit. If the economy is to sustain growth, an innovative milieu is necessary.

The cultural and institutional environment then becomes important to sustaining endogenous economic development. Saxenian (1996) studied the culture and institutions of the Boston Route 128 and Silicon Valley regions. She suggested that the Silicon Valley is more competitive than the Boston Route 128 region because it has *open links* between technology firms and i surrounding financial, education and public sector institutions. A high tech region with a collaborative and supportive institutional environment will be more sustainable. Consequently, Saxenian advocates regional institutional development. The “industrial systems built on regional networks are more flexible and technologically dynamic than those in which experimentation and learning are confined to individual firms” (Saxenian, 1996, p.161). She points out how open regional collaboration can nurture flexible specialization.

“Regions offer an important source of competitive advantage even as production and markets become increasingly global. Geographic proximity promotes the repeated interaction and mutual trust needed to sustain collaboration and to speed the continual recombination of technology and skill. When production is embedded in these regional social structures and institutions, firms compete by translating local knowledge and relationships into innovative products and services; and industrial specialization becomes a source of flexibility rather than of atomism and fragmentation” (Saxenian, 1996, p.161).

In these ways human capital and high tech can be nurtured by a regional institutional infrastructure that is collaborative and supportive.

An institutional environment for using knowledge is necessary for economic growth. Romer (2002, p. 1) notes that “the most important ideas of all are meta-ideas. These are ideas about **how** to support the production and transmission of other ideas”. Other analysts have acknowledged that the institutions which support the innovative use of new knowledge for profit-making increase the efficiency of an economy (Grossman & Helpman, 1994; Sala-I-Martin, 2002). An environment that has institutions for using knowledge and technology must be in place in order to maintain economic growth.

Research universities are recognized as institutions that use knowledge and technology. The greatest asset for a New Growth strategy, especially in the case of the IALR may very well be the presence of a research university. In “What is the Role of the Public Universities in Regional Economic Development?” Luger and Goldstein (1997) describe how the role of the public university has evolved from one which provided education to the working class to one which transfers technical knowledge throughout its region. Luger and Goldstein identify eight possible outputs from research universities that have implications for regional economic development (Luger & Goldstein, 1997). The role of a public university, as defined by Luger and Goldstein’s outputs, can be summarized in the missions of a land-grant university (see Table 1).

Table 1: Summary of the missions of a land-grant university using outputs defined by Luger and Goldstein

Land-grant missions	University role in economic development
Education	Teaching students, the workforce and their community
Research	Creating basic knowledge and transferring know-how
Outreach	Capital investment, leadership in social problems, and creating an innovative “milieu”

The presence of a research university can have positive spillover effects in the surrounding economy. The university can be described as a growth pole that emanates from the pool of talent it attracts (Florida, 1999). Audretsch and Felman (1996) mapped clusters of innovative firms in the US. They determined that if shared knowledge is important in an industry, firms would tend to cluster where new economic knowledge is the greatest. University research can generate new knowledge and knowledge firms will cluster around higher education institutions as a result. Research parks, which are associated with universities are more likely to provide economic development for their regions than research parks which are not associated with a university (Luger & Goldstein, 1991). Universities, such as Carnegie-Mellon and the University of Texas at Austin have created spin-off companies for profits (Florida, 1999). New firms and innovative products will cluster in the local economy.

However, In order for growth to stick, the region needs an innovative milieu - regional companies that have the capacity to absorb the development (Feldman, 1994; Florida, 1999; 2002a; Luger & Goldstein, 1997). As Mary Feldman (1994) concluded in her case analysis of John Hopkins University and the Baltimore area the presence of a research university alone does not guarantee economic prosperity. An innovative infrastructure, including specialized business services that would support technology

innovation, cluster industries and venture capitalists is also required. Some researchers have defined “milieu” as that which attracts creative people who come because they want to be near other creative people (Feldman, 1994; Florida, 2002a). The “density of the milieu” for using university know-how is vital if the region is to retain growth (Feldman, 1994; Luger & Goldstein, 1997). Having an innovative infrastructure is necessary if having a university presence is to bring economic growth to the local economy.

III. Background

A. Economic description of the Dan River region economy

This section provides background information about the IALR program and the Dan River region economy. The Dan River region is located in Southside Virginia – the City of Danville and its surrounding counties. Southside Virginia stretches from the area south of Lynchburg to the North Carolina border. The west boundary is Highway 81 and the eastern boundary is the Atlantic coast. Danville is the largest city in Southside Virginia. Danville itself is about an hour north of the North Carolina Research Triangle Area and about four and one half hours south of the Washington, DC metropolitan area. Danville and the Southside region have long had an economy based principally on the textile and manufacturing industry. In the last century Danville stood as a regional powerhouse – “a key center of manufacturing and commerce in Southside Virginia” (Peters, 2003). However, the decline of the textile and manufacturing sector in the US has especially negatively affected Southside.

. The IALR is currently focused on is the Dan River area. Generally, the Dan River region economy is seen as exhibiting the following characteristics:

- population decline
- relatively high unemployment
- relatively low per capita income
- relatively low percentage of population with high school diploma and college degrees
- historical economic dependence on furniture, textiles and tobacco –both a manufacturing and agricultural base that is in decline. (IALR, 2001, p. 4)

The 2001 Partners in Virginia's Emerging Economy Virginia Tech's Southside and E-58 Initiatives report summarizes the economic status of the Dan River Region.

‘The economic disparity that exists among the communities of the Dan River region is well documented. The Dan River region’s population is

currently estimated to be about 109,000 and since 1990 has decreased 1.1%. In contrast, the state of Virginia has seen an 11% increase in overall population. The Dan River region's unemployment figures have consistently been well above the state and national norms. In May 2000, there was a 6.6 percent unemployment rate in the Dan River region. This is considerably higher than the state reported figure of 2.5% and the national figure of 4.1%. Since 1990, the Dan River region has experienced negative growth in real per capita adjusted gross income; today the per capita personal income is approximately 70% of the national average' (IALR, p. 2).

Three data sets are available about the Dan River region economy. The Future of the Piedmont Foundation has commissioned two economic analysis reports (*Future of the Piedmont Community Report Learning, Working, Winning: the Dan River Region's State of the Region Report*, 2003; *The Dan River Region economic report*, 2000). As an undergraduate academic project Jean Plymale completed a focused economic base study about the Dan River region economy (Plymale, 2002). Her analysis of the Danville metropolitan statistical area, using census data from 2000 and other sources, has been cited by IALR and in eCorridors reports.

The three data sets suggest the following about the economic status of the Dan River region. In general, the population has a several decades long history of emigration that seems to be slowing. At last Census count the population was slightly increasing but not keeping pace with the state. The age range is diverging between elderly and youth, with a growing number of elderly and children. The race mix is roughly 70% white, 29% black and 1% other. There are slightly more females than males. Although unemployment seems to be slightly decreasing, it is still higher than the state and national average. Personal income is lower than the state and per capita income is growing at a slower rate than in the state and the nation more broadly. The service sector in the region is larger than the manufacturing sector. A unique characteristic of the region is that it

has a larger health sector than do comparable areas in other regions of the state. Traditionally, the community has relied on jobs that did not require high tech skills, higher education. The community has about a 2% higher dropout rate than the state. Their teenage pregnancy rate was 30-60 per 1,000 compared to the state's roughly 3 to 1,000. Higher education and high school completion rates are lower than the state's. Wages are also lower than the state average. In general the data suggests that the Dan River region is economically more stressed than either much of the rest of the state or the nation.

B. History and overview of the IALR

The state of this economy became an incentive for external intervention in the regional market economy. In the 1990s a group of eight native businessmen formed the "Future of the Piedmont Foundation" in order to address the perceived decline of the region. They saw their hometown going into economic decline and they pledged themselves to make it stop (*The Dan River Region economic report*, 2000). They proposed educating the workforce and developing a regional economic development plan (*The Dan River Region economic report*, 2000, p. 25). The Future of the Piedmont (FOP) reflects a private sector leadership vision for economic development (*The Dan River Region economic report*, 2000, p. 24).

The Institute for Advanced Learning and Research (IALR) was established in 2002 as a collaboration of private philanthropists (including the FOP), government and education organizations (IALR, 2003c). Partners included Virginia Polytechnic Institute and State University (Virginia Tech), Averett University, Danville Community College, Future of the Piedmont, Pittsylvania County, City of Danville and the local K-12 school

systems (IALR, 2003c). Again, these part of the local governments Virginia Tech, the state's largest land-grant university was designated as the IALR leader. Its primary goal was to establish advanced learning programs in the region. The Institute seeks to serve Danville and the surrounding area (IALR, 2003c). The IALR economic development program is a form of regional stewardship. Regional stewardship "emphasizes a commitment to place rather than issue, an integrated approach to solutions, and the development of broad coalitions sharing a regional vision" (Foster, 2001).

The collaborators developed a strategic plan for economic development in their region. At the beginning, the plan included two main concepts: 1) early access to the most advanced network technology or building telecommunications infrastructure and 2) building human infrastructure (IALR, 2001, p. 6). "The institute's programs will serve as catalysts for developing an innovative, high tech, network-based economy that provides opportunities for the upward mobility of the region's citizens" (IALR, 2003c). The 2003 five strategic goals of the Institute are:

1. Advanced learning
2. Strategic research and technology transfer
3. Conference center
4. Technology infrastructure development
5. Outreach

Advanced learning

The first goal of the IALR is to promote advanced learning. The advanced learning goal is to create curriculum and classes to educate the local workforce in technology. A part of the new research facility space will be used for academic programs (IALR, 2003c). Learning programs will be developed to lead students from grade school, through community college and into higher education or advanced technology training.

Educational institutions within the IALR will collaborate with external firms and other educational institutions to establish advanced learning programs in the region.

Strategic research and technology transfer

For the strategic research and technology transfer goal, the IALR will set up research centers. Topics, such as, robotics, motor sports, polymers, biodefense, high value horticulture & forestry, and bioinformatics, were chosen because related local resources existed. The new technologies developed at these centers will be extended to private industry for its use in commercial development (IALR, 2003c). For example, the high value horticulture and forestry research center will be an interdisciplinary effort with IALR, Virginia Tech's department of horticulture and forestry and the Virginia Bioinformatics Institute (IALR, 2003e). The IALR plans to encourage the transfer of research technology into the local economy.

Conference center

The IALR research facility will be the "area's cyber-park – an industrial park with research-related and high-tech businesses" (Peters, 2003).

"The dominant feature of the building is a cylindrical glass atrium, which is flanked by classrooms, conference rooms, offices, an auditorium and 15,000 square feet of research space. One conference room overlooks the intersection of U.S. 58 and the Danville Bypass and will feature six plasma television screens" (Reklaitis, 2003).

The conference center and meeting spaces were designed to attract industrious people to the area (IALR, 2003c). The cyber park area is for the area business community to meet and use high tech conference technology (IALR, 2003c). This area will support local business development and recruitment (IALR, 2003c). The new building, which opened this fall, will serve as a central point for high tech economic development in the region.

Technology infrastructure development

The IALR plans to facilitate the construction of technology infrastructure in the region in the form of high tech research facilities and high speed telecommunications network connectivity.

The new IALR center will house technically advanced research infrastructure capabilities.

“The ICC consists of over 20,000 square feet of meeting, marketing and learning space that is not only unique to Southside Virginia, but rivals the best facilities throughout the Southeast. With the 8,500 square foot great hall which is divisible into 6 salons, 100-seat executive auditorium, 4 exceptionally appointed business conference rooms, stunning atrium, multiple break-out rooms, all equipped with advanced technology, the ICC offers a sophisticated and inspiring meeting environment. When the ICC is combined with the Advanced Learning wing, consisting of the 27 multi-purpose classrooms, computer rooms and seminar rooms and representing an additional 13,000 sq ft, together they can accommodate approximately 2000 people at one time.” (IALR, 2003a).

The facility is designed to support research activities that strengthen economic competitiveness in the Danville area (IALR, 2003c). conferences will be held at the facility. The conference and research center will serve as one central point for innovation stimulation in Southside.

The IALR coordinates the eCorridors project for the Dan River region. The eCorridors program goal is to build an affordable, high speed, broadband network in the Southside region. The program utilizes Network Virginia, a Virginia Tech program that leverages public and private funds to make the Internet accessible state-wide (eCorridors Team, 2001c). Rural regions in the US are underserved by access to telecommunication networks in relation to high tech areas.

“Leaders of disadvantaged communities have stated repeatedly that they need an advantage, something that high technology players and innovators want. In addition to an array of economic and social benefits for citizens and businesses, the e-corridor environment would result in unprecedented opportunities for technology companies to do 'expeditionary marketing' with significantly reduced barriers to entry, and attenuated risk to their established business models and markets” (eCorridors Team, 2001e, p. 1).

The first phase, called eDan will connect Pittsylvania County and Danville (IALR).

Ceremonial groundbreaking for eDan fiber deployment occurred on June 11, 2002.

Further west along route 58, the LENOWISCO planning district commission proposes to connect Lee County, the City of Norton, Wise County and Scott County via an optical fiber network. In the long run the program plans to connect small communities along Route 58 from Norfolk to Bristol and beyond (eCorridor Team). The eCorridors plan will “level the playing field for disadvantaged communities [by giving them] . . . access to the most advanced next generation communications and Internet services” (eCorridors Team, 2001b, p. 1). The proposed speed is an exponential jump from current bandwidth speeds. It is projected to meet the future high tech requirements of the Department of Defense, research universities and the private sector (eCorridors Team, 2001a). The IALR, in coordination with the eCorridors program and working with the public and private sectors, has set itself the goal of connecting the Dan River region with accessible telecommunications infrastructure.

The network would be accessible for not just high end technical corporate research, but also for small businesses and individual Internet access. The program will tie into the Dan River business incubator, and seek to encourage entrepreneurs to use the network infrastructure for innovative business development (eCorridors Team, 2001b).

IALR will collaborate with the regional incubator, the Dan River Business Development

Center, to encourage innovative startup companies emerging from the IALR's research program (IALR, 2003d). Traditional telecommunications networks have focused exclusively on the consumer network, in which users merely consume information, not produce content or services. "The eCorridors concept is focused on the vision that every consumer has the potential to become a producer of information services on the commodity Internet" (eCorridors Team, 2001d, p. 1). Similar to the Blacksburg Electronic Village model, small businesses in Southside will be encouraged to use e-commerce (eCorridors Team, 2001c). The eCorridors Program offers training to the Southside community through Virginia Tech's Electronic Villages Program (eCorridors Team, 2002). The network will be an "economic development magnet" (eCorridors Team, 2001c, p. 11). However since the network is designed to encourage innovation, the eCorridors team is clear in saying that access is not just for e-commerce, but also for "education, entertainment, and communication" (eCorridors Team, 2001a, p. 7).

Outreach

Through outreach, the institution extends its education, research and institutional capacity to the community it serves. In the Dan River region the IALR has worked on community development programs, such as VT Stars, a church-based tutorial, an entrepreneur group, math literacy programs, computer refurbishing program, K-12 faculty development, urban design and planning, community capacity building, and arts and tourism efforts (Franklin, 2004). The IALR plans to stimulate many new people to come to the region with its conference center and is working to connect regional tourism assets. Virginia Tech will use its institutional capacity to help pave the way for Southside

development. For example, it helped to work through legal constraints for developing a public telecommunications network (Bowie, 2000; eCorridors Team, 2001e).

The institution reached out for funding and external organizational support in order to pursue community development programs in the region. Virginia Tech agreed to search for funding resources and to use its own resources where applicable. Startup support for the Institute and eDan was generated from public and private sources (IALR, 2003c). The Future of the Piedmont raised \$3 million. The City of Danville and Pittsylvania County pledged their share of the Tobacco Master Settlement Agreement, along with an additional \$1 million in 2003-4 for operating costs. Meanwhile the Institute has attracted nearly \$6 million in other funds for specific economic development and educational programs (IALR, 2001, p. 10). By bringing a varied resource pool (people, knowledge and funding) to the program, the members of the IALR will be an economic catalyst for the Dan River region.

IV. Application of New Growth Theory to the IALR program

A. Knowledge and Human Capital

The IALR is seeking to create a knowledge-based program – designing research centers and institutionalizing advanced learning. Successful use of knowledge as a factor requires an intentional investment in forward looking use of capital and technology. The IALR program is an example of intentional action to use knowledge to grow an economy. Without the proactive actions of the Future of the Piedmont Foundation, Virginia Tech, Averett University, Danville Community College, Pittsylvania County, and the City of Danville the region’s economy would continue to decline. Furthermore, the successful use of knowledge for economic development insures against diminishing returns. The long term will be insured against diminishing returns to avoid what happened to the textile/manufacturing sector. In theory, the IALR knowledge based economic plan will establish economic growth for the long term.

Long term growth will be a product of the human capital that the region generates. High tech has been defined as the accumulation of human capital knowledge (education and skill) that people have which can be turned into profit-making. Currently, education levels are in the lower range for the state and the nation. Educating the workforce is going to be crucial for building the Dan River region economy. Human infrastructure development is key in the IALR emerging economy proposal (IALR, 2002). In a policy report for the Southern Rural Development Center, Paul Green (2003) found that workforce development networks can address the rural need for labor skills related to area industry. Rural workforce development is structured differently than urban, in that rural encourages employers to provide more training rather than

having the local community resources provide the training (Green, 2003). The Danville Community College, an integral endogenous capacity in the region, has a history of partnering with local manufacturing firms in order to design and offer tailored training programs. For example, the Danville Community College stepped in to provide technical training so that Essel Propack could recruit trained labor from within Danville (Peters, 2003). They also worked closely with Goodyear Tire to provide specialized trained labor (Peters, 2003). The IALR will use its own educational organizational capacity in partnership with the research organizations it recruits in order to train the local workforce. The Institute builds upon the endogenous history of providing workforce training and adds its larger capacity for research to create training linkages with new research organizations.

The IALR plans to design technology training programs for the region. The education of the workforce and training them in high tech is integral to the IALR economic development plan. The vision is one of the Dan River region acquiring core competency in high tech research. Workforce development will mean linking IT job attraction and focused technology training (Plymale, 2002). The IALR strategy is to train the endogenous workforce in high tech skills, and to link them with the research jobs that will be created. The IALR will partner with existing education providers and private high tech firms to increase the Dan River region's labor skills and capacities. Southside Virginia's citizens will have access to degree programs created in collaboration. Non-profit-“partners, such as the National Institutes of Aerospace, will offer complementary programs to advance the Innovation Economy in Southside” (IALR, 2003b). Core prep courses will be offered by feeder education organizations in order to

make the technology transfer seamless (IALR, 2003c). The education program is not simply at the advanced level, but will also include feeder education programs that will begin at the K-12 level. Programs, through the partnership “will develop and offer a seamless set of postsecondary programs through the Institute for Advanced Learning & Research. These program offerings will increase mathematics, science and technology-based education and workforce preparation through targeted graduate, undergraduate, and associate degree programs, a combination of credit and non-credit certificate programs and stand-alone courses, and through continuing and community education activities” (IALR, 2002). In this way labor skilled in research, that is linked to the skills required by recruited organizations, will be created endogenously. When research jobs become available in the area they will be filled by an endogenous workforce. The strategic plan describes these education programs as seamless (IALR, 2003d). The link between education programs and job creation is the strongest reason why talented labor would remain in the area. Also, the core competency in high tech research will ensure that the community is competitive within the global community.

On the other hand, the IALR strength in focusing on technology and research for its advanced learning curriculum may also be its principal weakness. Even with a specialization in high tech research centers, the workforce would still need to be flexible and adapt to different research requirements. The assumption is that by educating and training the existing workforce they would be able to adapt to different research requirements in the future. Along with high tech skills, the workforce needs to be innovative. The technology skills are important, but teaching creativity may be more

related to being innovative. Thus, including the liberal arts in the curriculum would also be important.

In 1862, the Morrill Act stipulated that land-grant universities would “promote the liberal and practical education of the industrial classes in the several pursuits and professions in life” (Luger & Goldstein, 1997, p. 104). As such, Virginia Tech, in its role with the IALR has a responsibility to provide both a technical and non-technical curriculum for the Dan River region program. The Dan River region workforce could study in Virginia Tech’s non-technical programs. Developing business and public service knowledge and capacities in the workforce could also aid economic development. For example, the IALR could recruit students into the graduate programs of the School of Public and International Affairs or the Pamplin business school through scholarships and recruitment. To attract the “creative class” (Florida, 2002c), area entrepreneurs will need to raise the level of amenities, such as hotels and restaurants available in the region.. As such, recruitment into the Virginia Tech Hotel and Tourism program could be an opportunity for more diverse living- wage employment. Averett University, a small private liberal arts university located in Danville, is also a member of the IALR coalition. The Advanced Learning program could benefit from including liberal arts curricula from Averett College or other public universities in the region. Virginia Tech, because it has a strong technology and research program, is particularly suited to lead the Dan River region economic growth program. However, other liberal arts universities located in southern Virginia could train the future educators and healthcare workforce for the region. Instead of relying on a single high tech sector to be

the growth industry that trickles down, the workforce could be more diversely educated, thereby mitigating the risk of high tech failure inherent in a high tech strategy.

Rapid high tech expansion could have positive and negative externalities for the workforce. The externalities can be positive in that creative people tend to have higher expectations that raise the standard of living and generate new business (Florida, 2002a). However, the externalities can also be negative in that they gentrify the area and put traditional businesses at risk (Florida, 2002a). The economic level could rise faster than the current population can absorb. Current residents would then be forced out of the region due to a divergence in their wage level and the rising cost of living. Accumulating human capital requires an intentional intervention; the IALR might be more humane if it diversified its education program.

Summary

Successful application of knowledge as a factor for economic development requires an intentional investment in forward looking use of capital and technology, which the IALR is doing by building research facilities and a high speed telecommunications network. NGT supports developing a core competency in research, which the IALR is proposing to do through its research centers. The IALR plans to use knowledge not just to transition but to leap the Dan River region main sector from manufacturing to technology. This transition gives the IALR plan a comparative advantage over an alternative strategy of trying to attract manufacturing. Successful use of knowledge according to New Growth Theory will position the Dan River region economy for potentially unlimited returns and thus give it a future competitive advantage.

Human capital is defined as the knowledge (education and skill) that people have

which can be turned into profit-making. Accumulating human capital requires an intentional intervention in the environment in order to build it. Building human capital is the future of the region. Linking workforce development to high tech education is a challenge. The area has exhibited an endogenous capacity for linking industry labor demands to training for the workforce. The presence of educational institutions with high tech resources in the IALR coalition offers a capacity that the endogenous community now lacks. It now becomes a matter of creating the curriculum at all levels of education and implementing the program. One caveat to building human capital in the Dan River region is the recommendation for a liberal arts education. The entire population is not going to become high tech specialists . Timing workforce development with job attraction is going to be a challenge for the IALR. Remembering to build in higher education liberal arts training could diversify the labor force and possibly alleviate the wide wage range that could result from a rapid shift to high tech.

High Tech

High tech as an economic development tool is hard to conceptualize. Although the academic literature defines it as the accumulation of human capital in high profit margin companies, the public gravitates to the use of physical technology. The IALR has built a fancy high tech research facility and collaborated to bring in high-speed bandwidth to the area. Also, they are recruiting high tech research organizations. When one remembers that high tech requires the accumulation of human capital the advanced learning goal of the IALR becomes more important than its highly visible high tech infrastructure building.

New Growth Theory suggests that economic growth occurs by generating new knowledge. However, for that new knowledge to generate profits some basic infrastructure and human capital is available. Although the IALR did identify transportation, such as waterways, roadways, railways and communication networks, as key catalysts for economic growth (eCorridors Team, 2001c), the strategic plan places more emphasis on transporting “information” rather than transporting industrial goods, people or freight. Can Southside survive with only an information highway and a minimal transportation highway? Is a ground transportation infrastructure necessary for economic development? Even though infrastructure for eCommerce may not increase development, not having it will surely hinder any development (Peters, 2003). However the same could be said for ground transportation infrastructure. Currently the highway system and airport are less developed than those available in other high tech research areas, such as the DC metropolitan area or the North Carolina Research triangle. Not having basic transportation infrastructure in place makes the Dan River region less competitive.

Other US regions are also using high tech strategies for growth. The Dan River region will also compete globally when it chooses to use knowledge. High tech research is a specialization in the overall high tech sector. By choosing a high tech research strategy the Dan River region seeks to position itself on the upswing portion of the global economy.

However, high tech sector development has a more varied success rate than manufacturing. More high tech firms win and lose than with the manufacturing sector, so the gap between the winners and losers is wider. This means that relying on high tech

alone is risky. The IALR program assumes that without high tech growth the Southside region cannot be competitive. It also assumes that there is still a demand for high tech research. Their advanced learning, research facilities, research centers and technology infrastructure are all designed to attract exogenous research demand. It is a plan that requires upfront capital expenditure. What will be the result of this high upfront expenditure? Investing solely in high tech without diversifying increases the failure risk for the Dan River region. Instead of achieving exponential growth it could fail tremendously. What is likely to occur is a widening gap between those who succeed with technology and those who do not. Investing everything in high tech may produce job growth but it does not guarantee that the aggregate economy will grow. A selected highly trained portion of the Dan River region community could benefit, but the less advantaged will likely suffer more.

Issues of equity are brushed aside when only job and firm growth strategies are used as criteria to judge community development success. The strategy to create research parks has the potential to raise the income level of the professionally skilled, but it also creates negative externalities for the less educated (Luger & Goldstein, 1991). An area with a less well-educated population [like the Dan River region] may not have the labor supply for a high tech workforce and thus the new high tech research sector may be required to import labor (Luger & Goldstein, 1991). The extremes in income levels and education required between high tech and service jobs could create negative externalities for the less educated and unskilled population in a local economy. Although the goal of the research parks in the Luger and Goldstein study was not to redistribute income, the researchers noted that few alternative strategies rate high in affecting income

redistribution (Luger & Goldstein, 1991). Because income redistribution is infrequently included in an economic development plan, PolicyLink, an Oakland based organization, has made suggestions for promoting regional equity (PolicyLink, 2002) (See appendix two). Campbell has suggested more inclusivity in economic development plans by planning for equity as well as economic growth (Campbell, 1996). The endogenous community in the Dan River region has a right to an economic development plan that addresses issues of equity.

Summary

Using high tech as an economic development tool is hard to conceptualize. For purposes of this paper, using high tech for economic growth means accumulating human capital that is then devoted to profit-making. At its inception phase the IALR is seeking to attract high tech organizations rather than build human capital. On the other hand, attracting high tech organizations could lead to funding which would enable the IALR program to build future human capital.

Choosing to build a capacity in high tech research, as NGT recommends, may be the comparative advantage the region needs. High tech and perhaps only high tech has the potential to achieve exponential economic growth for the region. Intentionally using technology could make the Dan River region competitive again in the global market. However, NGT assumes that economies have an even playing field as to their physical and social infrastructure, and the Dan River region is at a disadvantage because it has less physical (highway and airport) and social (institutions for knowledge) infrastructure than other high tech regions.

Also, high tech growth is more divergent than alternative sector growth. With more potential for gain comes the potential for higher loss. More firms succeed and fail than with the manufacturing sector, so the income gap between wage earners is wider. Only using a high tech focus could result in externalities for the endogenous workforce. Considering equity in economic development is missing from NGT and it is difficult to ascertain at this stage of program implementation if it will be addressed in the IALR program.

Innovation and Flexible Production

The concepts of flexibility and innovation are fluid ones. In order for an economy to sustain unlimited returns it has to be organized for rapid innovation and continual flexibility. At the same time it must benefit from specialization. Is it practically possible for any one economy to be so adaptable? Setting up research parks is one way that an economy can insure that it has access to innovation from the new research that is produced. Encouraging clusters will encourage growth by attracting more firms. An area can attract spillover effects from nearby high tech research regions. The IALR program considers these aspects.

The IALR innovative product is its research facility and the research that it produces. In the Dan River region program “research” will be the sector product. The IALR program hopes to generate the benefits of specialization by providing a sophisticated state of the art research facility, while also retaining flexibility because the product is research. Ideally, the research facilities would provide an economy of scale for conducting research. Since competitive markets would ensure that the most economically competitive research is conducted, the research center is a flexible, but competitive

“product.” The center is a generic research facility, that will be adapted to whatever industrial research can be attracted. Its strategy is to create capacity for high tech *research*, in general. Building research center capacity will generate a flexible, but competitive sector in the region.

However, this strategy may miss out on the benefits of specialization. At this time the IALR is developing a capacity in generic high tech research. At first the specific research centers will be linked to area resources. For example, the Department of Defense will conduct unmanned vehicle testing and research on a local auto racing track. Currently a wide range of research projects are also being recruited. As IALR launches its efforts many options are being tossed in the air to see which one will generate a successful venture for the center. According to Cortright and Mayer, existing competitive US high tech regions have specialized in a particular type of high tech (Cortright & Mayer, 2001). On the other hand, they also suggested that in order to succeed, new high tech regions will have to try diverse strategies. Does this mean that the Dan River region could be competitive by maintaining a flexible production capacity for all types of high tech rather than choosing one? The various research centers do not share a common specialization. They may be too varied to support a common cluster in the region. The IALR seems to be testing to see which high tech specialization will stick in the region. When a high tech specialization begins to stick IALR staff will know they have found a demand for their product. Once a specialization for the region evolves out of the proposed options, the IALR can then develop a strategy to further industrial clustering.

Nearby regional high tech clusters could disperse into the region if their cluster specialization matches. Firms cluster with other firms that have the same specialization. Gary Shoemith, a specialist in southern economic renewal at Wake Forest University, says Danville could get a boost from cluster effects by being in proximity to the North Carolina Research Triangle Institute (Peters, 2003). Clusters tend to be regional and to disperse intra-regionally. The North Carolina research triangle and DC metropolitan regions specialize in biotechnology, so if the Dan River region wants to attract regional dispersal it might wish to specialize in biotechnology too. Research centers were chosen based on area capacity and existing clusters. In the case of the polymers center, a small cluster of firms was already located in the region. As the IALR program develops organizations a high tech research specialization may evolve. Clusters denote specialization in a particular industry. To encourage cluster formation the region will need to identify a common research focus.

Public- private research partnerships are occurring at both the inception and production phase of the product life cycle. Research parks are being created to meet this demand. In their 1991 study of US research parks, Luger and Goldstein argued that the market was saturated (Luger & Goldstein, 1991). Because existing parks already have the innovative milieu to sustain high tech growth, new research would gravitate to existing parks. The IALR has built a high tech research facility and is recruiting a number of research organizations to use the facility. Its facility will be the center of the Danville research park.

Creating new research parks is risky. Many fail. The ones which have succeeded are near universities, have strong forward-looking-leadership and are in large regions.

The IALR program has strengths in all three. First, Virginia Tech has an outreach office in Danville. Having a research university, such as Virginia Tech, coordinate the economic development program makes the future research center at Danville more attractive. Second, forward-looking-leadership can mitigate the possible risk that high tech will fail. The members of the IALR have made a commitment to economic development in the region. The staff has led fundraising and instigated programs for high tech growth. Third, the success of a research park can be boosted by being near a high tech region. The Dan River region is located between the DC metro and NC Research Triangle regions. Having high tech infrastructure could attract spillover effects from these two existing high tech regions. The IALR program plans to have the technology infrastructure in place to attract external users. The initial US research parks succeeded because they had existing research capacity at a time when demand for high tech research began. The original research parks attracted government research capital because they had existing research capacity and were near universities. The same situation may work in favor of the Dan River region. A high tech research center strategy could be a success in the region because of the presence of Virginia Tech, the IALR leadership and being in proximity to the DC metro and NC Research Triangle region.

Does the Dan River region have the innovative environment that could support high tech growth? Audretsch and Feldman (1996) have analyzed the spatial distribution of innovation and production. When specifying innovation by state, both Virginia and North Carolina fell in the 100 range (Audretsch & Feldman, 1996, p. 632). The 100 range is about midpoint for innovative states. That standing suggests that these states have had innovations while other states reportedly have had none. The spatial map also

shows that most innovation occurs in coastal states, mostly California and the New England states. Virginia and North Carolina also border the coast and are more innovative than the Midwest states. Thus, we could surmise that the Dan River region in Virginia has the geographic locational advantage to be innovative. However, Audretsch and Feldman (1996) specify innovative areas by state rather than by region and Virginia's innovative propensity is centered in the Washington, DC metropolitan area.

Although the IALR program is located in a region that does not have a history of high tech, it is physically located between the DC and NC regions. Both Raleigh-Durham and Washington DC have higher than national location quotients for employment in high tech (Cortright & Mayer, 2002). Thus, research production facilities from the DC metropolitan area and the North Carolina Research Triangle could migrate to the Dan River region. What factors could encourage migration?

Earlier this year, Essel Propack, an Indian company that supplies Proctor and Gamble with toothpaste tubes, relocated from Greensboro, North Carolina to Danville (Peters, 2003). The cost of doing business in Greensboro was much higher and \$200,000 in incentives from local and state funds capped the deal (Peters, 2003). Although Danville was able to compete with the North Carolina triangle area for a manufacturing facility the region does not currently have a competitive advantage in research facilities. Building research facilities in Danville could have backwash effects for North Carolina. However, the backwash growth might not stick in Virginia. Innovative research could start out in lower cost Virginia and then be drawn by better infrastructure and a higher skilled workforce to North Carolina. Thus, in the long run the IALR would be better to try collaborating with the North Carolina Research Triangle region.

One ingredient for collaboration is a shared vision (Gray, 1989). One example of a shared vision would be to use one of the proposed research centers – bioinformatics. In order to conduct bioinformatics research, both Virginia Tech and North Carolina Research Triangle labs have received grants from the National Institutes for Environmental Health and Sciences (IALR, 2003c). Virginia Tech will locate a share of its bioinformatics research at IALR in order to be in proximity to North Carolina Research Triangle labs (IALR, 2003c). Since both Virginia and North Carolina received federal funds for this type of research they share a common goal. The two could begin collaborating by working with bioinformatics as a shared vision. Unless a specific relationship between the two is created, Virginia Tech and the North Carolina Research Triangle could end up being in competition instead of collaboration. In 2003-4 the IALR plans to initiate and formalize its planned strategic partnerships, such as with UNC/NC State and the Research Triangle Institute (IALR, 2003d).

The IALR claims that by creating research centers in Danville it will create a mini-economic hub that will connect Virginia Tech and the North Carolina Triangle Area, thus creating a corridor of economic growth through Southside (IALR, 2003c). Although this scenario is surely plausible, two aspects of it need closer evaluation. First, the region does not have a highway system that would create a road corridor linking Virginia Tech and the Research Triangle Area going through Danville. Second, the Dan River region and the Research Triangle area are in two different states, which means they could compete for economic development capacity. Tax structures may be more favorable in Virginia, but the labor force may be more competitive in North Carolina. Markusen et al (1986) have warned about the long term minimization of public sector

infrastructure when development tax breaks are offered. A collaborative effort may offer a better long term solution. There are cases of cross state regional governance (Foster, 2001). The New England Council is one example of a business coalition that crosses the borders of six states (Kanter, 2001). A similar model of regional governance could be used in the IALR program to collaborate with the North Carolina Research Triangle region.

Danville could also take advantage of potential dispersal effects from the DC metropolitan area. Positive spread effects could be achieved by being in proximity to the federal government in Washington, DC. Importantly, in this regard, Virginia Tech has two satellite campuses in Northern Virginia. Even with Danville being physically far from DC, networking among faculty with DC community leaders could generate spillover effects for the region.

Institutional Environment and an Innovative Milieu

By attracting exogenous research projects from public, private and non for profit research organizations, the IALR could instigate an innovative milieu. Currently it seems that the IALR is focused on attracting exogenous capital and high tech organizations rather than generating endogenous capacity. Facilities for research are being offered, which potentially if the workforce is educated would bring jobs, but the product of the research will be used exogenously. Efforts to generate an innovative milieu, which would include formal technology transfer methods and methods to reduce barriers for local firms to adopt technology, could be strengthened. Virginia Tech has formal transfer methods, but whether or not they are adaptable for use in the IALR program has not been addressed. The eCorridors program does reduce barriers for local firms to adopt

telecommunications technology. However, will local firms be able to adopt new technology generated from the research centers? Currently, while high tech innovative firms do not exist in the region, the knowledge infrastructure created by the IALR represents a potential. Knowledge infrastructure grows “innovative organizations and individuals that can lead to sustainable economic development” (Feldman, 1994). Finally, cultural and quality of life amenities, which are a necessary part of an innovative milieu, are not considered in the IALR strategic plan. Without a milieu, the IALR may invest in technology infrastructure that will only benefit the exogenous economy and not stick in the Dan River region.

Developing a high tech strategy for Danville will only be beneficial to the local economy if the growth sticks in the region. The Dan River region lacks a high tech institutional network and supportive professional services. One researcher, deVol, has argued says that the milieu is not necessary until after the initial inception of a high tech growth strategy (deVol, 1999). As the high tech research centers at IALR evolve, these types of peripheral organizations need to be developed too.

Since Danville lacks a support sector for high tech, nurturing entrepreneurship and small business could initiate an innovative supportive milieu. Entrepreneurship theorists, such as Leibenstein, Keizer and Schumpeter suggest that promoting entrepreneurship evens out imbalances as the market moves toward equilibrium (Malizia & Feser, 1999). Entrepreneurship opportunities could smooth out the job gaps for the endogenous workforce. Entrepreneurial start-ups require accessible venture capital (Saxenian, 1996). The IALR plan seeks to promote an entrepreneurial environment. Indirectly, it recognizes the benefits of entrepreneurship, but its focus is on attracting

large high tech research programs. Once large high tech organizations are located in the Dan River region, the workforce could create spin-off small businesses. In her article on the high tech region in the Washington, DC area, Feldman (2001) discusses how the workforce went through cycles of being employed by large institutions and being entrepreneurs. When the area job market was robust, labor worked in large companies, while when the job market fell entrepreneurs started spin-offs from larger companies. Entrepreneurship could balance out the job market for the endogenous population in the Dan River region. In the case of the IALR program, the benefits of promoting entrepreneurship may be less emphasized in place of the highly visible benefits of creating a high tech research sector. However, entrepreneurs could be a crucial missing piece for generating the necessary innovative milieu.

Virginia Tech, is an institution that generates and uses knowledge and, thus, is key in NGT for creating the innovative milieu. As a catalyst in the Dan River region, the IALR has the potential to become a national model for the role of a public land-grant university in regional development (IALR, 2003d). As a land-grant university, Virginia Tech has three missions: education, research, and outreach. In the role of coordinator of economic development for the IALR, Virginia Tech not only acts on these three missions it also acts in regional economic development. The ‘intellectual capital, research infrastructure and outreach interests of Virginia Tech’ may be the region’s answer to building capacity (Stephenson Jr., 2003). How are the three land-grant missions reflected in the IALR program?

The first mission of a research university is to provide education. In her comments about the future competitiveness of the Silicon Valley, Saxenian (1996) warns

against California's reductions in public funding for its educational institutions. The reduction "jeopardizes the rich supply of technical talent and the research base that have historically supported the regional economy." (Saxenian, 1996, p. ix) The true gold in a university is the smart people it generates (Florida, 1999). Universities face societal pressure to provide innovative knowledge and to develop a knowledgeable workforce (Luger & Goldstein, 1997). The caveat with combining it with its outreach – economic development leader role is for the workforce, once educated, to remain in the area. Universities, especially in small areas, can have a negative impact on the region when they contribute to brain drain (Luger & Goldstein, 1997). However, once North Carolina developed the Research Triangle area, more university students remained in the area after graduating. . The challenge is to draw students from area colleges to assist in the development project by remaining in the region following graduation. If the IALR can identify a skill set that is stronger in North Carolina universities and is needed for a specific sector in Southside, students from North Carolina could also be recruited. Virginia Tech can expand its curriculum to target the Southside workforce. First, it can continue to develop curricula within the existing public education system specifically tailored to the IALR program. Second, scholarships and research grants could be created for local students who wish to attend Virginia Tech after which they would be required to live and work in Danville for a specified amount of time.¹ Thereby, the benefits of the university teaching role would remain within its local region.

The second mission of a land-grant university is research. In this case, VT's research knowledge and capacities are being used to stimulate the Dan River region

¹ For instance, Malaysia funded educational pursuits for citizens who studied in Australia and Europe, with the stipulation that they return and work in Malaysia. Ben Henderson in the UAP 5104 course midterm also made the suggestion to create scholarships for local students in the Southside area.

economy. The research capacity of the university is reflected in the choice of research centers. A primary function of a university is transferring knowledge to the general public (Luger & Goldstein, 1997). Virginia Tech, through the IALR, contributes to transferring knowledge. Part of its technology transfer goal is to support the development and marketing of intellectual property rights (IALR, 2003d). It remains to be seen if the benefits of the research that is generated will be transferred to the endogenous community. Research universities offer comparative strengths over commercial industrial research (Florida, 2002a). For example, their faculty is not only versed in creating new specialized knowledge, but they are rewarded for keeping abreast of wider knowledge (Florida, 2002c). Wider knowledge is reflected in a university's support of basic research. Theories have emphasized the differences between basic and applied research. Some emphasize that basic research is the reason to be for a research university. Basic research can lead to applied research which may be harnessed for economic benefit. In citing other researchers, Luger and Goldstein argue that since basic research is not directly applicable to economic gain, it is more likely to be funded by the government. Luger and Goldstein (1997, p. 108) claim "that the infusion of research dollars into selected local economies creates a wave of additional spending in the region that is an important source of regional growth". Virginia Tech has attracted federal research funds to the region. Basic research can lead to applied research, but applied research is not generated without previous basic research. Virginia Tech could supply the basic research for future applied research. However, its role in this case seems to be that of supporting applied research in the proposed research centers.

The third mission of the land-grant university is outreach. Through their outreach mission research universities also play a role in creating innovative milieu. Virginia Tech, as the leader of the IALR, looks for ways to link its resources to the community. A research university tries to connect Tech faculty to local businesses and not-for-profit organizations. Doing so, as in the cases discussed in Solutions for America, could result in building the endogenous community strengths of the Dan River region. From 1999 to 2001, the Pew Partnership for Civic Change set out to document successful programs by community organizations which dealt with “tough challenges in communities across the [US]” (Freedman, 2002). The results of the program were published in a report, Solutions for America. The original research model was to use a team of researchers who would travel to nineteen selected community organizations and document the programs. Instead, a “hub-and-spoke” model evolved, which meant that a local researcher was teamed up with each organization. The assessment of the Solutions for America group was that local research partners and community organizations were “unambiguously positive” about having worked together (Freedman, 2002). Subsequently a roundtable discussion was held to identify what worked about collaborating. By collaborating, local researchers, community organizations and funders achieved these benefits for their community:

1. The hub-and-spoke model brought together researchers and service providers from the same community.
2. Three quarters of the partners continued to work together after the program evaluation finished.
3. Funding agencies benefited because the partnerships strengthened the evaluation research in program operations.
4. Organizations learned research evaluation skills.
5. Colleges and universities strengthened their ties with their *local* communities.

In these five ways it was a productive outreach program for its local community. The IALR Director, Tim Franklin states that the IALR is set up to be a permanent “intellectual hub” in Southside rather than a short term project as in the Solutions for America case (Franklin, 2004). The IALR will network within its community to build endogenous capacity for high tech and research skills and to build the Dan River region’s innovative milieu.

Summary

NGT suggests that an innovative milieu is necessary for the benefits of an economic development plan to stick. A milieu includes mechanisms for technology transfer, firms which adopt technology, local clusters and cultural and quality of life amenities. Nurturing high tech entrepreneurship is one way for the IALR to encourage the growth of supportive high tech peripheral organizations. However, NGT does not offer ways which the innovative milieu can be developed nor does it speak to when the innovative milieu should be created. The milieu is supposed to develop along with high tech sector growth. Creating a collaborative and supportive regional environment could hasten the growth of an innovative milieu. Regional environments offer stronger effects from collaboration, flexible production and institutions.

The institutions to nurture are the ones that use knowledge. For example, the research universities generate spillover effects from teaching, research and outreach missions. The direct leadership of a land-grant institution may give the Dan River region a competitive edge. Virginia Tech has the ability to provide technical education to the region. It attracts technology research and brings it to the Dan River region; without its presence the Dan River region could not attract high tech research. Building upon the

geographic location strengths of the region, Virginia Tech could be the catalyst for encouraging the growth of Washington, DC research demand and the North Carolina triangle research supply into its region. In its outreach role, the university attracts venture capital (public sector funding) and as an institution serves as an actor for building community capacity. In the final analysis (for this paper, anyway) the IALR represents an institution that started as a collaboration with civic leaders and could continue to empower other leadership in the region. It serves as a magnet for people who want to experience and to work towards development in the Dan River region. As such, it could potentially be the parent institution for spin-off institutions that could build the institutional capacity of the region necessary to support a knowledge-based economy.

V. Limitations of NGT: quality of life aspects

NGT emphasizes creating an innovative economy over other aspects of community development. During start-up the IALR has placed a stronger emphasis on creating an innovative economy rather than on other aspects of community development. Max Stephenson (2003) draws on the “leadership, community development and on governmental/nonprofit organization literatures” to suggest ways that a university, such as Virginia Tech could lead social as well as economic change in the Dan River region. The Silicon Valley 2010 project, a public-private collaboration for economic development initiates a new way of thinking about regional economic development by shifting from quantitative growth (more jobs, more consumption) to qualitative growth (better jobs, better use of resources) . . .” (Henton, 2001, p. 398). The Silicon Valley joint venture implements the need for collective discussion and community decision-making for economic growth (Saxenian, 1996). The Silicon Valley 2010 project set four initiatives:

1. innovative economy
2. livable environment
3. inclusive society
4. regional stewardship through civic engagement (Henton, 2001, p. 398).

The Silicon Valley has a more economically advanced high tech sector than the Dan River region. Still, the IALR strategy is to leapfrog to a new era of technology driven economic growth by creating an innovative economy. As it is in the inception phase, the IALR program has placed a stronger emphasis on creating an innovative economy than on other aspects of community development. A Dan River region economic development program could bring in more quality of life aspects by including the last three Silicon Valley initiatives.

Livable environment: attractive living space

For example, how attractive is the region to live? The surrounding area has an attractive environment. Nearby Danville are lakes, rivers and the great outdoors. Fairy Stone State Park, a half hour to the west offers family camping, swimming and boating activities. To the North less than two hours away is Smith Mountain Lake State Park and to the east in about an hour is Buggs Lake with two state parks, Staunton River and Ooconeechee. The Blue Ridge Mountain Parkway is less than two hours west and the Mount Rogers Recreational Area about three hours, while Virginia Beach is more than three hours east. In North Carolina about 15 miles southeast is the Hyc0 Reservoir. The city center has an industrial look, but with a little artistic flair and a tourism plan, it could turn into an attractive urban area. Recently, Danville has made an effort to create a river walk in the down town area. “On the bank of the Dan River opposite downtown, old textile buildings will be renovated into a mixed-use center called Long Mill” (Peters, 2003). The development will become a mixture of condos and small shops – a “self-contained village” (Peters, 2003). Sprucing up the downtown area could attract Florida’s “creative class” to have innovative conversations in outdoor cafes. Remembering to care for their “great outdoors” would mean an attractive living environment for future generations.

Livable environment: health

On November 22, 2003 Governor Mark Warner attended the Martinsville Health Fair in Martinsville, a small city a city in the Dan River Region. Area health care specialists volunteered their time to the Fair to provide health care to uninsured Southside residents. During the fair Governor Warner spoke with a citizen who had just had

twelve teeth pulled. This is just one example of the lower standard of health care available to, and the relatively low health status of, Southside residents.

The Dan River region health data is deeply disturbing. But, the FOP economic report identified health sector as a growing sector in the Dan River region (*The Dan River Region economic report*, 2000). This is a sector that has a higher endogenous demand and higher supply capacity than that typical across the state. Institutionalizing health sector education, along with the proposed high tech curriculum could build upon endogenous demand and capacity. Although this field may not represent the high wage earning of a high tech field, the wage scale may create a more diverse wage scale for the Dan River region workforce. High tech regions, such as Arlington County, reflect dual sectors – high tech with high wage earners and the service sector with low wage earners. Building the health sector could have multi-economic development impacts: 1) creating more diverse wage jobs and 2) meeting the demand for health care and 3) raising the standards of life for residents.

Livable environment: environment

Campbell conceptualized a sustainable development triangle (Campbell, 1996, p. 298). In his model the three axes, overall economic growth and efficiency; social justice, economic opportunity and income equality; and environmental protection, compete with each other for program resources. The Dan River region model leans heavily on the overall economic growth and efficiency axis. In the Dan River region model, property and resources are being pulled away from equity and environmental concerns and used solely for economic growth. As Campbell suggests for sustainable development (Campbell, 1996) promoting green belt land use design and using technology to find

alternative clean fuels and resources could balance the conflicts in the “triangle” of the IALR plan. Protecting the environment is part of providing a livable environment.

Livable environment: equity

The other side of Campbell’s triangle missing from the IALR program is social justice, economic opportunity and income equality. Foster (2001) analyzed the effects of regional and local economic development plans on achieving equity. Although theoretically, regional plans are supposed to be better able to achieve regional equity, he found little evidence that either did. Instead he found that targeted equity programs, regardless of whether the governance structure was local or regional, have been effective. In short, if the aim is to minimize the socio-economic gap, targeted equity programs are necessary. Otherwise, the IALR program will simply result in increased income segregation. If external workers take the high tech jobs before locals can be trained, locals will remain in the service sector and in-migrants will gain high tech-higher wage jobs. The result will be a high quality of life for new immigrants and a lower one for current residents. The segregation could also occur between internal locals - those who succeed with high tech jobs and those who do not. If high wage jobs and industry are brought into the region, then the income level will rise. With economic growth the aggregate level of income rises. However, economic growth has also widened the gap between low and high income earners. Danville, because of its relatively poor health care and lagging educational indicators is at risk for seeing that gap widening with the proposed economic development plan. Simply promoting high tech growth is not going to ensure equity; most likely just the opposite will occur. Bringing in high tech jobs and industry is not going to trickle down to benefit the 53.6 out of 1,000 teenage girls who

get pregnant. Without social welfare programs the gap between those with the low and high incomes will increase (Mishra, 1999). An economic development model should consider social welfare programs.

One step in seizing the opportunity is to use economic data to create performance measures that identify the gap between higher and lower income populations. Economic data and performance measures could be tracked for the length of the program. For example, minorities and women earn lower wages than white men. It would be useful to gather wage data that is tied to occupation and race and compare it to a rural base, the state and the national level. The performance measurement would target a benchmark, such as 20% of rural women in the US to earn over \$35,000. The goal for Dan River region would be to match it. Housing is another area where equity could be factored into planning and resource allocation decision-making. . If high wage earners with high tech skills move into Southside, they could quickly price the existing wage earners out of the housing market as happened in Silicon Valley and in Arlington County. Low and moderate income housing should be set aside early and city sectors should be protected from gentrification. Setting equity performance measures now would insure that it is addressed in the program and not left simply to work itself out later.

Inclusive society: minorities

Minorities, in the case of the Danville River region, Blacks, Hispanics and Asians, earn lower wages than whites. In their study of US research parks, Luger and Goldstein (1991) commented that white men benefit relatively more than woman and minorities when the high tech research sector is developed. Is the answer to target minorities with specific social programs? In today's political climate affirmative action

has become controversial so that option may not be available. The IALR, in partnership with the CEO of Pittsylvania County Community Action, has started an affiliated group SCALE UP. SCALE-UP serves as “an advocacy group to link the IALRs agenda for change to the African-American community” (Felker, 2003). Another local program is VT Stars that targets underprivileged high school students for summer enrichment. Even if much more is needed, Virginia Tech and the IALR have taken a proactive stance with regard to economic inclusion. The Dan River region economic development program could benefit from an institutional presence that leads the way for greater equity for minorities.

Regional stewardship through civic engagement

Foster (2001) in his comparison of local and regional governance also observed that a “commitment to recognize and develop new leadership” is an important characteristic for economic development in new regionalism (p.28). The Future of the Piedmont has tried to develop new leadership for the region.

“Working with the Future Of the Piedmont Foundation, the Sorensen Institute for Political Leadership at the University of Virginia has conducted two year-long leadership programs to develop civic and political leadership within the region. A third class is being planned. The programs are similar to the state-wide programs the Institute conducts each year” (*Future of the Piedmont Community Report Learning, Working, Winning: the Dan River Region's State of the Region Report*, 2003, p. 5).

The Future of the Piedmont was based on “regional stewardship”, which “emphasizes a commitment to place rather than issue, an integrated approach to solutions, and the development of broad coalitions sharing a regional vision” (Foster, 2001, p. 28). The first FOP report suggested civic infrastructure as a one of the four action areas (*The Dan River Region economic report*, 2000). The three findings for this area are 1) local

governments are not unified in their economic development efforts; 2) the young, women and African Americans are not in civic leadership roles and 3) the nonprofit sector is ineffective. These findings speak to social capital aspects in community development. NGT emphasizes human capital over social capital. The Dan River region plan could encourage entrepreneurship, non-profits and community based planning in order to develop social capital, which will improve the quality of life in the region.

VI. Conclusion

The purpose of this paper was to apply New Growth Theory to the IALR program. The NGT framework: knowledge and human capital; technology, innovation and flexibility; and the institutional environment were exemplified in the IALR program. The theory describes the innovative economic strategies of the IALR. The program plans to instigate economic growth in the distressed region surrounding Danville. The IALR will set up the technology infrastructure to attract exogenous high tech research and it will accumulate human capital by better educating and training the endogenous workforce. The IALR will use knowledge as a factor in economic growth, especially by educating the endogenous workforce and linking their training to new high tech research jobs. The IALR program is intentionally investing in technology that will insure against diminishing returns. The institutional environment, especially as shaped by the actions of a research university, Virginia Tech, is an integral part of IALR's economic development plan. The program manipulates the factors of human capital and technology and has begun setting up an institutional environment with an innovative milieu.

On the other hand, NGT assumes that economic growth improves the quality of life, which may not be the case, especially when solely pursuing a high tech strategy. A Dan River region economic development program could expand upon NGT by nurturing quality of life issues as well as pursuing jobs and high tech growth.

What does the case illuminate about using NGT for economic development? Certain steps become apparent. Investing in technical infrastructure, such as research facilities and telecommunications network lay the foundation for knowledge activities to

become profit-making. Setting up highly visible endogenous projects that attract exogenous demand, such as the research centers, bring in venture capital and public funding. Building a physical structure, such as the IALR research facility can be used as a central point for institutional capacity building. Having and developing civic leadership is necessary for starting an economic development project, especially seen in the early stage of this case and for setting the program up for future generational action as well. Generating human capital through local advanced learning programs and linking the education and training to jobs in the region is crucial in economically distressed regions.

NGT is vague on the point of when each action it proposes should be pursued. Should the technology infrastructure be built before high tech research organizations are in place? The theory seems to say that infrastructure will naturally evolve as high tech organizations cluster. The IALR has chosen to build the infrastructure in the hopes that high tech will be attracted to it. Should the high tech sector be developed or should the population be trained first? In theory high tech and human capital should be nurtured at the same time. Although the IALR sees a need for both, it has pursued attracting high tech over accumulating human capital because of practical funding issues. It needs funding in order to create advanced training programs and funds are accessible for high tech research projects. Should labor be recruited externally or can it be educated in time to meet rapid high tech firm creation? Since the IALR is recruiting high tech before setting up advanced education and training programs, it may find the need to recruit human capital exogenously. Linking the demands for a skilled high tech workforce by new research organizations with endogenous capacity may initially not be practical.

Neither the theory nor the IALR case explains how the timing of workforce linkage can occur. Determining how to generate human capital and retain it in a given region is an ongoing discussion.

The theory seems to reference somewhat developed economies. It assumes that robust physical and social structure exist. The IALR is servicing an economically distressed region which has no history of being a knowledge-based economy. The Dan River region has minimal physical infrastructure. It also has a social and even political structure which were sustained by a textile and manufacturing sector economy. The social and political structures need to be acclimated to the idea of a radical shift in economic base. High tech job growth is not sufficient for economic development. Physical infrastructure and a receptive social and political structure are necessary, too.

Final Recommendation

Other than what the program has already done, what recommendation does NGT imply for the IALR program? The theory would suggest building on the geographic advantage of the region which is between two high tech areas – Washington DC and the NC triangle. The Dan River region could become the corridor which links these two regions into one high tech research area. Remember high tech regions tend to disperse intra-regionally. As mentioned previously both of these regions have a specialization in biotechnology. In order to create this link the IALR program needs to specialize in biotechnology by creating a specialized research facility for biotechnology and by accumulating biotechnology specialist skills in the workforce. The IALR could network with both regions and search for niche biotechnology markets which have not been accommodated. Although biotechnology research is not the same as health care, the idea

of biotechnology may be a psychological “selling point” to the local social and political infrastructure. The Dan River region has a large health sector and a population with a need for better health care, so the idea of shifting from textile/manufacturing to biotechnology research may be more appealing than shifting to high tech. In any case, NGT would recommend that in order to attract intra-regional dispersal, the IALR program should choose a high tech specialization similar to nearby high tech regions.

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Appendix One:

Policy suggestions for including equity in an economic development program (PolicyLink, 2002).

1. Negotiate with developers to promote linkages between building and the community.
2. Build coalitions for local living wages.
3. Campaign against toxic facilities in low-income, color communities.
4. Hold economic development programs accountable to the 3 e's (economy, equity and environment).
5. Promote fix it first transportation versus building new roads and highways.
6. Enhance equal education.
7. Promote fair housing standards and mixed income housing.
8. Create regional tax base sharing and regional governance options.
9. Provide public transportation for low income to make jobs and housing accessible.
10. Offer tax credits for lower-income business development.
11. Participate in a national housing trust fund which preserves rental housing for the lowest income.

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EDUCATION and CREDENTIALS

Masters in Public and International Affairs , Virginia Tech, Blacksburg	2003
Certified Project Management Professional , Project Management Institute	2001
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WORK HISTORY

Booz, Allen & Hamilton, Budapest, Hungary November 2001-December 2001
Project Management Specialist (Consultant), USAID Project for the European Regional Infrastructure Program
Led a train the trainer seminar for project management trainers as part of the Regional Infrastructure Program, an institutional capacity building project focusing on the transportation and water sectors in Eastern Europe. Also consulted on and analyzed a business plan template for the Bulgarian transportation sector.

US State Department, Washington, DC March 2001-October 2001
Sr. Project Management Specialist, Policy, Planning & Budget (assigned to Domestic Security Operations)
Served as a lead project manager to institutionalize project management at the Diplomatic Security Division of the US Department of State. Presented adult workshops on project management topics for managers. Consulted on the initiation and planning phases of security and policy projects. Created schedules and analyzed results for quality improvement to bring projects in on time and budget.

Teligent, Fairfax, VA November 2000- March 2001
Program Manager, Microwave License Protection

Architect of the Capital, Washington, DC September 1999-September 2000
Management Analyst, Office of Information Resource Management
Developed the first five-year strategic plan, including performance measurements, for the Office of Information Resource Management at the Architect of the Capitol. Conducted benchmarking interviews with five of the best GAO recognized IT offices. Created a "best practices" database for comparative analysis of strategic processes.

Peace Corps, Turkmen State University, Ashgabat, Turkmenistan September 1997-July 1999
University Instructor, International Relations & Law Faculty
Taught university level courses in strategic planning, marketing, economics, management and critical analysis in Turkmenistan. Presented global financial markets and banking lectures to the Turkmen Central Bank.

Wells Fargo Bank, San Francisco, California
Project Manager, Telecommunications September 1995-July 1997
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Acted as a lead project manager in the telecommunications division during the merger between Wells Fargo and First Interstate banks. Managed projects from start to finish, which included, scheduling, budgeting, writing proposals, insuring audit compliance and supervising project staff. Developed teams and processes, which spread and continued to exist.