

PROFESSIONAL RESEARCH PAPER

Technological Development in European and American Mid-Sized Cities: Cases of Cork, Ireland and Columbus, Georgia.

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Abstract

Knowledge-based industries are critical for the health of global economy. Today they are determining which regions are succeeding or failing. Without growth in high-tech sectors, regions will be left behind. In order to foster high-tech growth, regions must understand what location factors are most important for high-tech firms to flourish. This study aimed to analyze two regions through the prism of the most important factors that help to enforce entrepreneurial processes and establishing regional high-tech clusters. Examined regions share a number of similar characteristics in population size, industrial structure, and technological orientation. Both areas located at moderate distance from bigger metropolises and have comparative higher educational facilities. First region is formed around City of Cork, Republic of Ireland and the second one shaped around Columbus, United States.

1. Introduction

Traditional manufacturing can no longer provide the same level of growth in productivity and employment. Knowledge-intensive industries have taken the place of mass production as the economic engine for growth. The knowledge revolution has led to the creation of new, promising industries. The Information and Communication Technology (ICT) sector, new media or the Internet economies are new sectors and industries that are generally innovative and depend on the national and regional knowledge bases and innovative capacity. These industries hold the promise of high growth and high wage employment for the future.

Castells (2000) argues that in the late 1990s we started to reap the harvest from the seeds of the informational technology revolution that were planted in the 1970s. He argues that society has been transformed into an informational society. The term “informational society” indicates the attribute of a specific form of social organization in which information generation, processing, and transmission become the fundamental sources of productivity and power as a result of the new technological conditions.

In response to the relative decline in the importance of manufacturing and the rise of knowledge-based industries, governments worldwide have taken an interest in promoting high technology industry. In the U.S., the federal government has established mechanisms to help commercialize the products of federally funded research and development. In the Republic of Ireland government changed country’s policy to attract international high tech companies. Regions have also taken steps to promote high tech industry.

2. Theoretical approach

There are many approaches in the literature on explaining the establishment and growth of high-tech regions. While many take a case study approach, others try to find common occurrences and construct a theory out of them. One theory of regional technology

development is based on entrepreneurship. Miller and Cote take such approach in *Growing the Next Silicon Valley*. In their model, three inputs feed into the entrepreneurial process. These inputs make up the knowledge infrastructure of a region. The first is business inputs. This is divided into two categories, business expertise and venture capital. Through networks of venture capitalists, entrepreneurs are able to get the funding and advice needed to develop technology.

The second input to the entrepreneurial process is technical. The availability of leading edge R&D in a region provides entrepreneurs with technical building blocks. They can then use the local technologies to develop new products. Miller and Cote suggest that a region's R&D institutions need to have a market focus for new ideas to be transferred to entrepreneurs. Typically, areas with diverse technical strong points and research strengths will be most likely to be able to provide technical inputs to the process.

The third input to the entrepreneurial process is social. There must be a commitment by community leaders in both the public and private sector to technology based regional development. Attitudes of elites play an important role in providing a supportive social network for entrepreneurs. Quality of life in the region and state technology policy also contribute to this social input.

In this paper, the two regions are to be analyzed through the prism of those three inputs into entrepreneurial process. First region is formed in the Republic of Ireland around City of Cork and the second one located in the United States on the border of Georgia and Alabama. Those two regions make a good comparison base since they have been just recently recognized as emerging high tech areas and still into developing stage. Both regions have population of about the same size and focus on telecommunication technologies and data processing services.

3. Ireland's profile

For a number of years, researchers have looked at fast economic growth of the "developmental States" of East Asia. These States have been seen as cause for hope that nations could promote economic development, even from a subordinate position in the international division of labor. Until the 1990s, these developmental States represented the most spectacular economic success stories of this century.

However, a different set of countries has emerged in the 1990s that appear likely candidates for improving its standing in the hierarchy of the international economy. The Republic of Ireland is among those economies that have begun to change their relation to the world economy based on growing strengths in information technology industries.

“Celtic Tiger” is the label most often used to describe the remarkable force of the Irish economy. For the last six years, growth has been averaging nearly 9% annually, which is higher than any other country in the EU. Expectations were similar for 2001 although analysts are predicting a gradual slowdown largely because of emerging supply constraints.

The start for this great good fortune was a drastic change in economic policy, initiated in the late 1980s by slashing taxes, buying labor peace, and attracting foreign corporations. Those programs have been very successful. Nortel, now a \$33 billion-a-year global concern employing 70,000 people, has been joined in Galway by others big computer firms: Texas-based Compaq Computer Corp., PMC-Sierra Inc. of British Columbia, and ADC Telecommunications Inc. of Minnesota. High-tech centers located in Galway, Dublin and the southern city of Cork, are leading Ireland's transformation from an agricultural base to one driven by information technology and accompanying services. One-third of all the PCs sold in Europe today are made in Ireland. Nineteen of the top 25 computer companies in the world have set up shop in the country, including Microsoft Corp., IBM Corp., Hewlett-Packard Co. and Dell Computer Corp. In the spring, 2000, the Paris-based Organization for Economic Cooperation and Development reported that Ireland had surpassed the United States as the world's leading exporter of software, selling products worth close to \$5 billion annually.

The service industries now account for 60 per cent of Ireland's workforce. In the last 10 years, 265,000 jobs have been created in the sector, which accounts for 40 per cent increase. The per capita income has also grown. For the first time in Irish history, the country's 3.7 million people are richer, on average, than their British compatriots. According to the OECD, the Irish GDP per person is \$25,200 (U.S.), compared with Britain's \$22,300 and the EU-wide average of \$22,000. Ireland, in fact, is not all that far behind the United States' average of \$33,900.

For decades, Ireland's biggest export was its people. But an economic turnaround led by the high-tech industry is keeping technical talent at home. In 2000, there were 65,000 unanswered job openings in the country. The Irish Software Association predicts that employment in that sector alone, already providing 24,000 jobs, could increase this number to 40,000 by 2002.

A key element in Ireland's unfolding boom has been a series of three-year agreements between government, business and organized labor that, since 1987, has bought labor peace in exchange for guaranteed wage increases and tax cuts. Keeping labor happy is especially important, since 5.5 per cent, Irish inflation is the highest in the European Union and more than double the EU-wide average. Besides those three-year agreements, the Irish government has few other tools for controlling inflation. The country's inclusion in the single currency of the 11 nations "Euro-zone" has robbed Ireland's monetary policy-makers of the ability to hike interest rates to cool an overheated economy. The Euro, with its single interest rate set by the European Central Bank in Frankfurt, rules out that approach.

Another important factor of Ireland's success has been Ireland's ability to attract direct foreign investment. This was accomplished by slashing the tax rate for companies that export their products and services, from 40 per cent to 10 per cent. (Under pressure from the EU, that favorable rate will be applied to all companies, and increased to 12.5 per cent by 2003.) The result has been a massive influx of foreign money. Most analysts

believe that as much as a third of U.S. investment in the EU is now going to Ireland. Canadian companies have brought their share as well. Ireland is fourth among all countries as a recipient of Canadian investment abroad, attracting \$6.8 billion in 1999. There are about 100 Canadian companies in Ireland.

Besides low taxes, U.S. companies have flocked to the region by familiar business environment and common language. Ireland is an English speaking low-cost labor area with youthful population. According to Ireland's Industrial Development Agency (IDA) - 40% of the country's population is under 25-and an education system recently cited as Europe's best by the International Institute for Management Development.

The money pumped into Ireland by the EU to develop the country's infrastructure, also played its role in country's development. Over the past six years alone, the EU has channeled more than \$35 billion to build and refurbish Irish roads, bridges, airports, seaports, communications and a host of other infrastructure assets. "Those funds," says Michael McKenna, an assistant secretary at Ireland's Department of Enterprise, Trade and Development "provided a crucial buffer, especially since they arrived at a time of fiscal retrenchment."

4. Cork City profile

Located on the south coast of Ireland Cork City is the largest city in the South West region and the second to Dublin nationally (see the map for location). The current population of the City – as defined by the area administered by Cork Corporation and under the remit of the Cork City Development Board - is currently estimated to be 124,400 (down c. 3,000) from 1996. However, the Cork region includes Douglas, Glanmire, Ballincollig, Blarney, Tower, Midleton, Cobh and Carrigaline. This area has experienced quite rapid population and employment growth in the period since 1996. The population of this extended area is estimated to have increased by 4.5% to 251,000 persons in 2001. The Cork City is the major center of employment, higher education and cultural activities in the region.

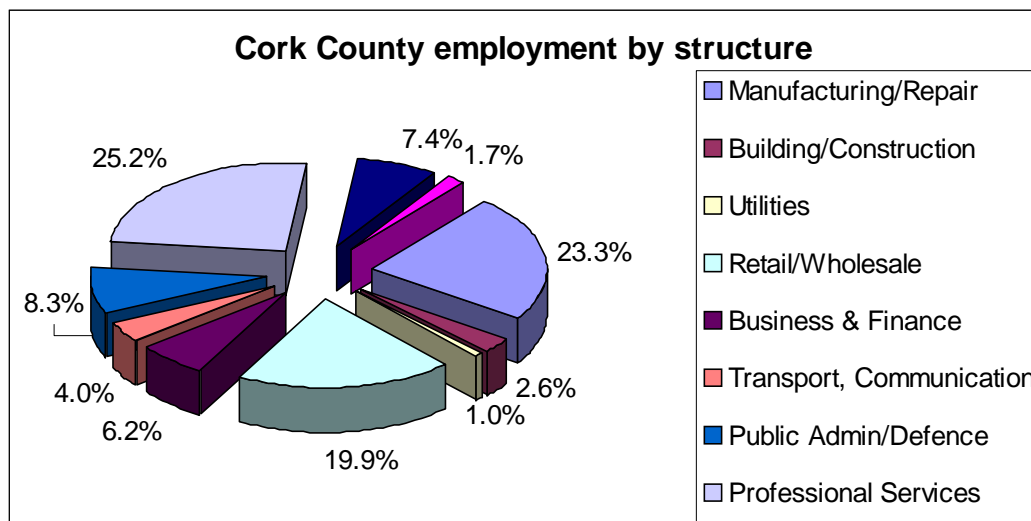


Map: Cork region

4.1 Economic outlook

The largest single category of employment in the City is “professional services” (see Figure 4.1). Professional services category includes education and training providers, hospitals, accountants, solicitors, architects etc. and accounts for 25.2% of all employment. Manufacturing and repair activities are the City’s second main areas of employment, accounting for 23.3% of employment. Jobs in the area of manufacturing/repair have increased by 47% since 1996, and are relatively evenly dispersed throughout the City. Within this sector, an area, which has expanded considerably, is software development and systems engineering. After manufacturing, the only other area in which employment has grown is business and finance, with 30% more jobs. Much of this growth is due to the growth of the telemarketing sector.

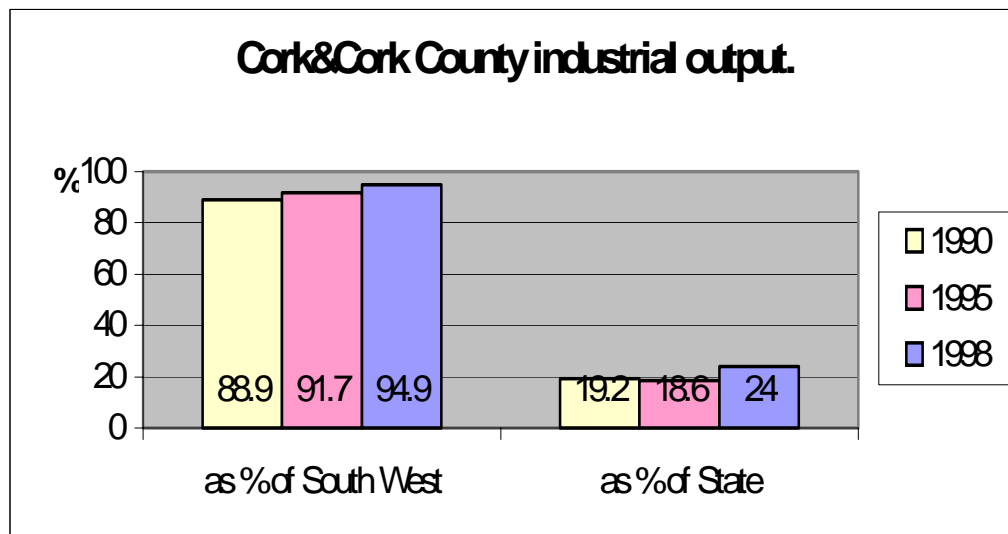
Figure 4.1



Source: Cork City Development Board

Gross industrial output in Cork (both City and County combined) has almost tripled from 1990 to 1998, amounting to over £12.2 billion in 1998. Over the same period net industrial output in Cork increased by almost 370%. Cork's share in country's and South West region output had also improved and accounts today for 24 and 29.9 per cent respectfully (see Figure 4.2).

Figure 4.2

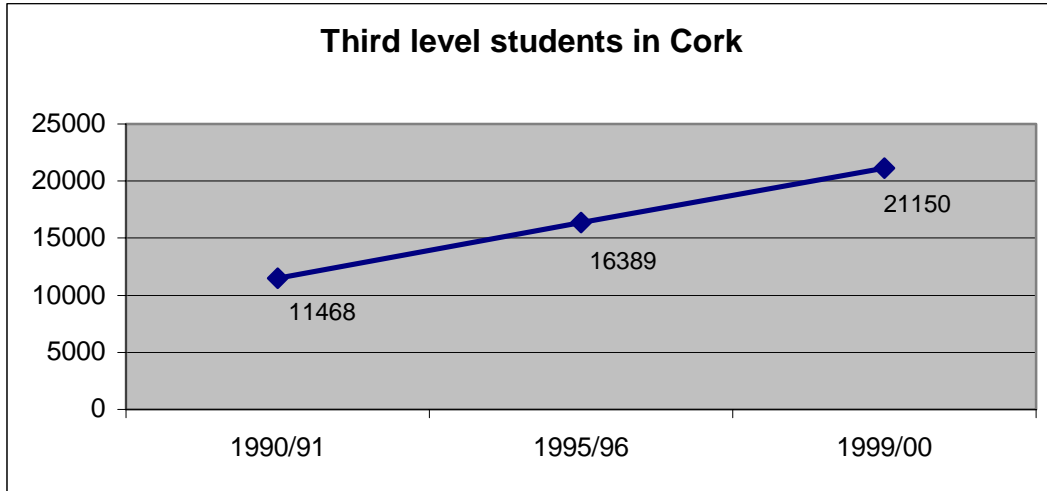


Source: Cork City Development Board

4.2 Availability of educated workforce

During the period from 1990 to 2000, the number of third level students studying at University College, Cork (UCC) and Cork Institute of Technology (CIT) rose by 84.4%. At present more than 21 thousand full and part time students enrolled in region's universities. This does not include the 5,802 people enrolled in CIT in 1999 as apprentices, second level students, in adult education classes etc. Figure 4.3 illustrates the increase in student numbers in Cork over the period 1990-2000.

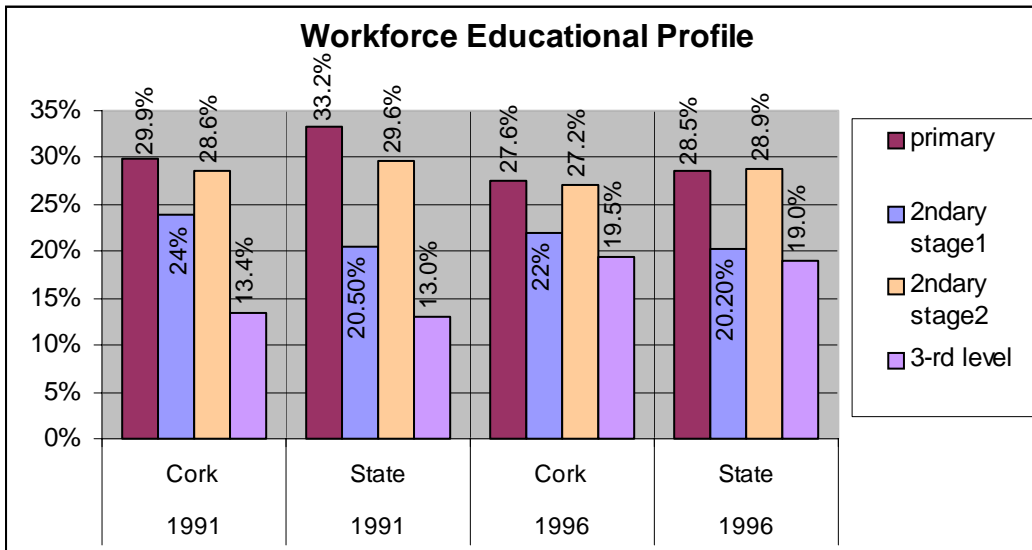
Figure 4.3



Source: Cork City Development Board

Currently one fifth of the regions working age population have an academic degree. Those figures mirror the national increase in share of people with third level education (Figure 4.4). In 1996, 7187 people aged 15 and over in Cork City had a scientific or technological qualification – this amounts to 7% of Cork City’s total population aged 15 and over at the time. This share is higher than the national one in 1996, when just 5.7% of the total population aged 15 and over held a scientific or technological qualification.

Figure 4.4



Source: Cork City Development Board

4.3 Policies and infrastructure that encourage R&D

Research and development (R&D) activities in Cork City are mostly concentrated around the two higher education institutes. University College Cork and the Cork Institute of

Technology house a wide range of research units, institutes and centers, many of which work in partnership with industry in the field of R&D, specialized training, technology licensing and patents, joint ventures etc.

Cork City hosts four Programmes in Advanced Technology (PAT) centers. Located in UCC each PAT center aims to develop the application of new technologies in specific area and to transfer them to industry. Cork's four PAT centers focus their work on advanced manufacturing technology, biotechnology, electronics, and telecommunications.

In order to foster industrial development in the regions, UCC has joined forces with the University of Limerick and UCG, the private sector and Enterprise Ireland through the Technology Transfer Initiative. This project will support the development of indigenous industry, particularly in the software, food and pharmaceutical sectors.

There is no Cork City-based innovation center but one Business Innovation Centre (BIC) is located just outside the City boundary and providing serviced incubation space, access to seed capital, general and specialist advice to high potential, technology or technology-enabled businesses. Approximately 50% of BIC clients are from Cork City. The center provides serviced business incubation space for 15 companies. Currently there is no serviced business incubation unit provider in Cork City. However, on September 2001 the National Software Centre in Mahon is to be open, which will include 1,859 sq. meters for business incubation and shared services.

Figures from Forfas show that while business expenditure on R&D in Cork City has risen by 18% since 1991, this is considerably lower than the overall national increase of 221.9% for the period 1991-97. Taking into account the fact that Ireland is ranked 22 among 46 countries in its R&D expenditures the picture is even more depressing.

In 1997 the total business spend on R&D in Cork City and County accounted for 10.7% of the national total, falling from 15.3% in 1991. Besides, the City's share of national R&D expenditure has fallen from 4.1% in 1991 to just 1.5% in 1997. By comparing Cork City's R&D expenditure per capita with the national level, the extent of underspending is evident. On the basis of the 1996 census, Cork City's population stood at 127,187 – this represents 3.5% of the national population in 1996 and one year later Cork City accounted for just 1.5% of national expenditure on R&D.

Besides R&D underinvestment, Cork has other problems, which can slower its further development. According to Cork Corporation, current broadband technology in Cork is inadequate for existing needs and is having a negative impact on region's competitiveness as an information technology center. The current price of a broadband circuit from Cork to London is 7% higher than that from Dublin to London. The extra cost of broadband technology relative to Dublin gives Cork an added economic disadvantage.

4.3 Venture capital and programs supporting start-ups

Venture capital in Ireland is an expanding but relatively immature business, which in terms of R&D based start-ups, tends to focus on areas such as e-commerce and computer software where outputs can be moved forward with a relatively low level of investment. However, it does not mean that entrepreneur's who are willing to start new businesses are completely ignored. The Cork City Development Board (CCDB) provides some assistance through its member organizations:

- The Cork City Enterprise Board (CCEB) specializes in supporting locally based industries. It can offer direct grant aid to manufacturing industry, internationally traded services and in certain circumstances the service sector. Services provided by the Board include advising on how to convert the idea into business, business plans developing, financial assistance through grants, training programs, etc. In order to promote and encourage an Enterprise Culture, CCEB supports several programs towards students at all levels. Those programs provide young participants with entrepreneurial education and give them an opportunity to setup and run their own companies within a controlled environment. For third level students the program provides both financial and advisory assistance to qualified projects.
- The Cork Business Innovation Center, already mentioned above, provides hands-on assistance in the areas of Financial Management, Strategy Development, Marketing, Technology/Innovation Services, Shared services and facilities and Management Development to small and medium enterprises. Besides, the Center runs the Graduate Enterprise Programme to promote start-ups. This program provides support to graduate entrepreneurs who wish to start their own business.

4.4 Summary

This quick overview of Cork's economical and entrepreneurial climate shows that all components necessary for further development and support of high-tech industries are presented in the region.

Cork region is one of the most developed in the country and has a competitive position in the Europe. During last several years, its GDP rose from 83% from EU average to 105% in 1996. Cork region enjoys favorable geographical location and developed infrastructure. However, a lot has to be done to improve road quality and expand regional telecommunication network.

Regional workforce is young and educated. That gives a hope that the area will not experience future shortages in skilled labor. But further grow of technology based sector is likely to cause greater income disparities and increase the risk of sustainable unemployment for workers in their 50-s and those with lack of technical skills. Special programs should be developed focusing on adult's education and job training courses.

Cork City has a developed chain of R&D facilities and incubators. But relative underinvestment in R&D as well as focusing solely on e-commerce and computer software could seriously limit region's opportunities for diversification its economy.

It can be concluded that the high-tech sectors are the main source of output and employment growth in the region's economy. In particular, looking at the total growth in Cork manufacturing employment, one can say that increase in region's manufacturing employment is a result of the increase in employment of the technology oriented firms. For region to sustain its growth over the long-term, therefore, it is necessary to increase investments in the "raw materials" (researchers, research, expertise, technology and innovation capability in firms).

5. Georgia profile

Georgia is the keystone of Southeast dynamic, rapidly growing region and with retail sales exceeding \$500 billion annually, the Southeast is expected to be one of the strongest markets of the 21st century. Today, Georgia's 8.3 million population is the country's 10th largest. Georgia was the nation's fourth fastest growing State after the last census, and another 380,000 inhabitants are expected to relocate here by 2005. Georgia is optimally situated in the heart of the Southeast, closer to major national markets than many eastern seaboard States.

Georgia's modern infrastructure allows the State to serve as both a center of commerce and innovative technologies. The first fiber-optic cable was manufactured in Georgia, and now State is a transmission hub for the country's two largest fiber-optic trunk routes. Georgia also leads the nation in the deployment of ISDN technology with switches Statewide. And communications research continues with the help from Georgia Center for Advanced Telecommunications Technology.

Georgia provides the ideal business climate, which fosters business development. One of the State's major programs designed to invite and support the leading industries of the 21st century is the Yamacraw Mission. This initiative united government, academia, and private industry to extend Georgia's position as a global leader in the broadband communications technology. The result is that Georgia is ranked in the top five for high-tech job creation, and is an acknowledged leader in the field of broadband.

Another program, the Georgia Research Alliance, brings strength to State's educational community in supporting research programs in advanced communications, biotechnology, and environmental technology. Georgia's Advanced Technology Development Center is the nation's most experienced university-affiliated technology incubator, offering a wide range of business support services to help entrepreneurs successfully operate technology businesses. Georgia also provides an attractive package for new and expanding businesses in the State, including extensive tax credits and academic research support. For closer economic profile of the State, see Table 5.1.

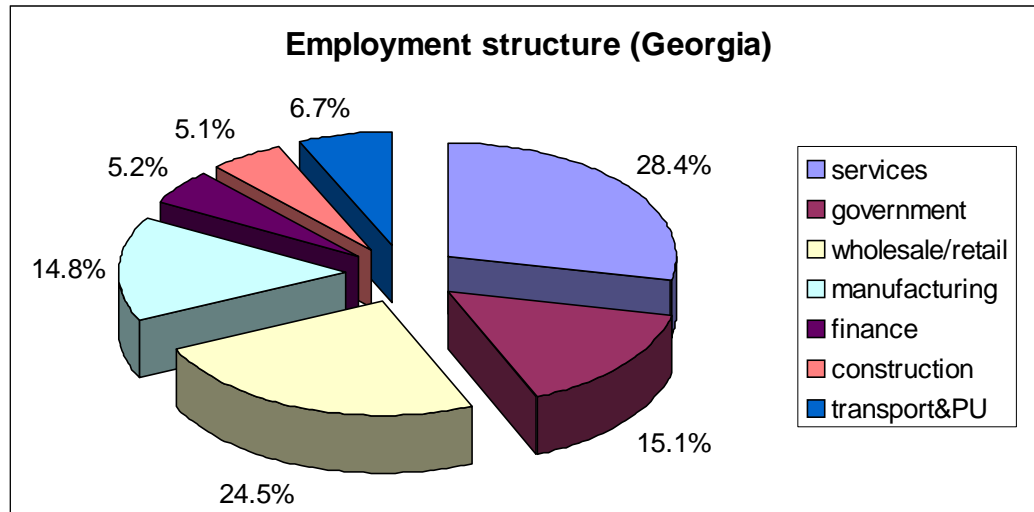
Table 5.1.

Economic Performance	Innovation Output
Employment growth per year, 1990 to 1999	Patents per 10,000 employees
in Georgia: 3.36% (rank 7) in the US: 1.90%	in Georgia: 4.0 (rank 31) in the US: 6.3
Average wages in 1999	Patents growth per year, 1990 to 1998
in Georgia: \$30,869 (rank 18) in the US: \$32,109	in Georgia: 6.41% (rank 15) in the US: 3.19%
Wage growth per year, 1990 to 1999	New establishment formation, 1990 to 1999
in Georgia: 4.38% (rank 10) in the US: 4.03%	in Georgia: 6.55% (rank 7) in the US: 4.60%
Gross State product per employee, 1999	Fast growth firms (Inc 500), 1991 to 2000
in Georgia: \$57,488 (rank 14) in the US: \$56,882	in Georgia: 174 (rank 8)
Annual growth in exports, 1995-1999	Initial public offering proceeds per 1,000 firms, 1999
in Georgia: 6.41% (rank 17) in the US: 4.41%	in Georgia: \$23,847 (rank 1)

While the State has experienced strong growth, certain parts of the State are lagging behind. There are many counties that grew slower than the national average. In general, these counties tend to lie along the southern side of the fall line, essentially a line from Augusta to Columbus. There are 17 counties, in which employment fell over the past decade. For those counties the special tax incentives program has been designed to foster economic development. The amount of tax credits set to the particular county depends on the rank (tier) to which this county is assigned. The arrangement to tiers is determined annually using a county ranking that is based on four factors: (a) unemployment rates averaged for the last three years; (b) per capita income averaged for the last three years; (c) the percentage of residents below the poverty level; and (d) the average weekly manufacturing wage of the county.

The workforce in Georgia is one of the most advanced in the nation and accounts more than 360 thousands specialized workers. Georgia's technology employment ranks in the nations top ten; with Atlanta coming in second among 30 cities in software job growth. Figure 5.1 represents the structure of Georgia's employment by sector.

Figure 5.1



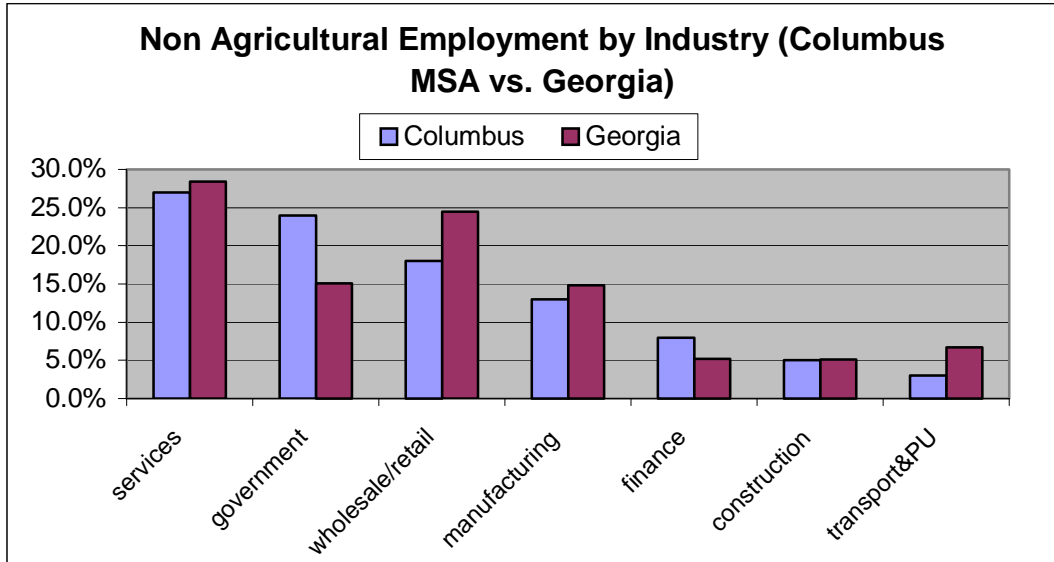
Source: Georgia Department of Labor

Georgia has 53 senior colleges and universities, 26 two-year colleges, and 34 technical institutes. Graduate studies are available at 17 public and 12 private institutions. Nevertheless, Georgia is ranked 22nd in the nation for percentage of the population age 25+ with a college degree. About 7.8 percent of the State's population has advanced degree (20th place nationally). Eager to secure its highly educated workforce Georgia established HOPE - the largest comprehensive scholarship program in America. Financed by the State lottery, the HOPE scholarship has assisted more than 420,000 students since 1993.

6. Columbus profile

Columbus, Georgia is the urban center of commerce for a seven - county trade area of west central Georgia and east central Alabama (see the map). The Columbus region includes following counties: Chattahoochee, Harris, Marion, Muscogee, Russell, Talbot and Taylor. The area contains more than 570,000 people whose effective buying income accounts for about \$7 billion. The large part of the region is located on the Fort Benning Military Reservation, United States Army Infantry Center. It affects region's economy, and labor force.

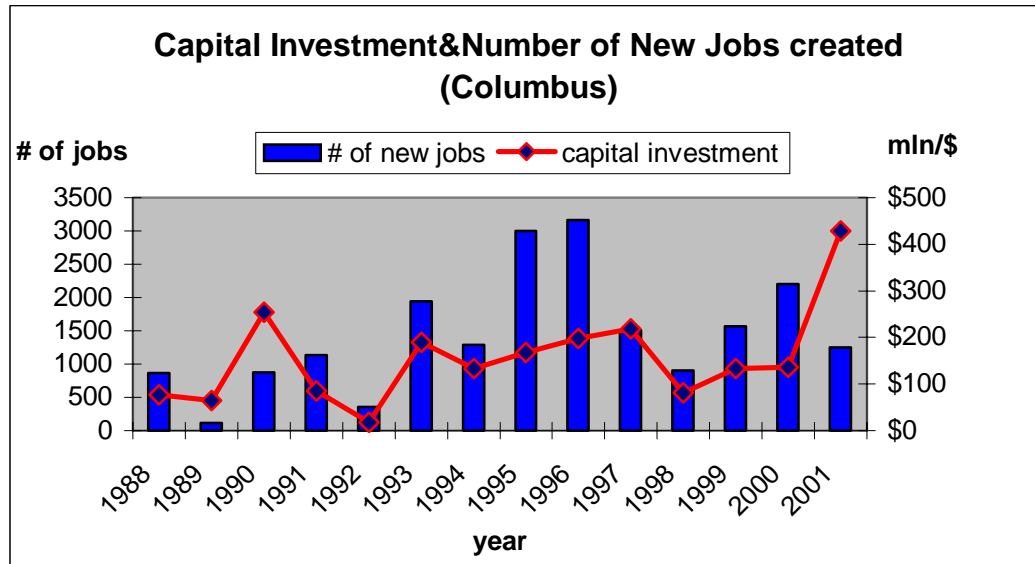
Figure 6.1



Source: Georgia Department of Labor

Communication infrastructure is one of the main components for attracting new businesses into area. Columbus offers low cost and well-developed telecommunication network with electronic and digital switching capacity serving over 115,000 toll-free lines in the area. Customers can call Columbus, Cussetta, Fort Benning, Hamilton, Pine Mountain, Woodland, and Waverly Hall, Georgia, as well as Phenix City and Fort Mitchell, Alabama without a long distance toll charge. Central offices are equipped for digital connectivity, and over half of the customer lines in the county are now served digitally. Columbus has computerized switching with fiber optics—the leading edge technology necessary in today’s business world. With more than twenty diverse fiber rings supporting local services, telecommunication companies have been able to meet the service demands of area businesses. Technology has enabled newcomers such as Carmike Cinemas Inc, and Delta Data Software Inc. to make Columbus their home. Figure 6.2 illustrates total investment in region’s economy during past fourteen years and the number of new jobs created.

Figure 6.2



Source: Columbus Chamber of Commerce

6.2 Policies and infrastructure that encourage R&D

Region is a home to six four-year colleges and regional research and development activities are mainly concentrated around them. Auburn University is the largest in the area and has a number of research facilities. In 1997-98, Auburn University's total organized research spending amounted to \$72,528,144. Auburn has major technical competencies in the fields of biotechnology, pharmacology, agriculture, composite materials, textiles, catalysis, biological and chemical detection systems and systems for atomic and space power applications. Auburn University has standard procedures allowing technology transfers for interested companies.

The Center for Business and Economic Development at Georgia Southwestern State University provides support services to existing and potential business, economic development agencies, and local governments in the area. These services and assistance include the conduct and dissemination of business and economic research, consultancy services, and development and conduct of staff training programs.

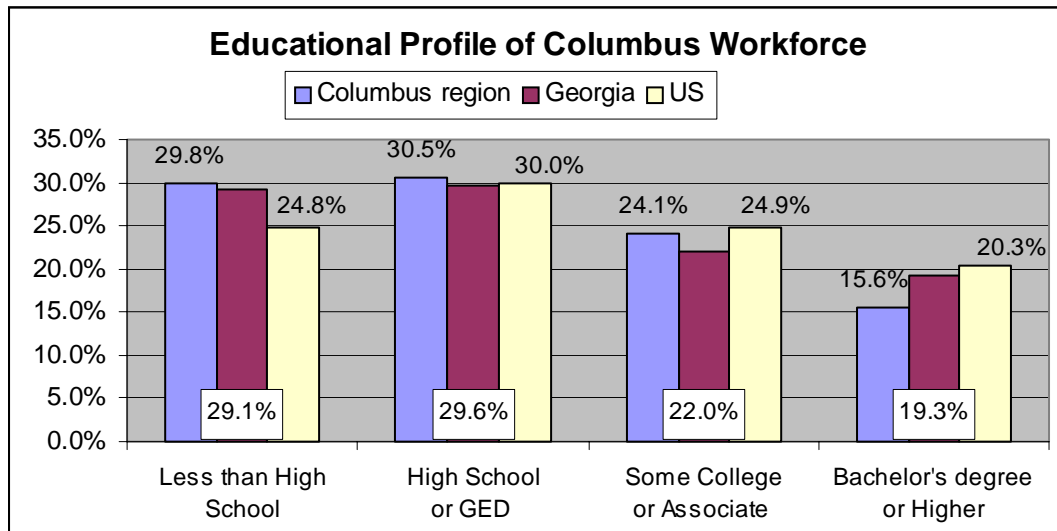
The Regional Economic Development Partnership (REDP) was established in a region as a cooperative effort by several institutions of the University System of Georgia to "leverage" limited resources available in rural Georgia, making available to these communities the facilities, support, and intellectual capital of local and other participating units of the University System. The REDP includes the University of Georgia, Georgia Southwestern State University, Albany State University, Darton College, Abraham Baldwin College, Valdosta State University, and Bainbridge College, with official representation by the Georgia Department of Industry, Trade, and Tourism and the Georgia Department of Community Affairs.

6.3 Availability of educated workforce

Labor force of high-tech oriented community must keep up with the overall economy's changing demands. The shift from a traditional agrarian and manufacturing-based economy to a more service-oriented and information-based economy requires workers to have some higher education, whether technical school, community college, or a four-year college degree. Also, employment growth means that additional, qualified workers are needed.

One of the best indicators of the quality of a region's labor force is educational attainment. The most recent county-level data available on educational attainment is from the 1990 Census. As shown in the Figure 6.3, 70.2% of the persons aged 25 years and over in the region have at least a high school diploma or GED. About 15 per cent of the region's working age population has an academic degree, which is a bit less than both State's and national average.

Figure 6.3



Source: Columbus Chamber of Commerce

Hopefully future picture will look more encouraging. About 38 thousand students are currently enrolled in six universities located in the area. As a matter of fact, Columbus has developed most of Georgia's innovative state-funded training programs. The best one, the Intellectual Capital Partnership Program allows up to 500 Columbus State students a year to receive \$10,000 loans that are forgiven if they work in Georgia for four years after graduation. Such strategies helped the region to solve the shortage in educated labor force.

6.4 Venture Capital and programs supporting start-ups

A number of services for small business start-ups are available through the Columbus Chamber of Commerce programs. Those programs provide a full range of services including professional consulting; business plan development, mentoring, help with finding a sponsor and identification of capital resources.

Regional start-up companies are eligible for Georgia BEST incentives program, which provides new companies with tax incentives in accordance with the company's location. A program assigns counties to four tiers and offers incentives according to the tier level of development, where fourth tier represents the highest level of development and first tier – the lowest. The Columbus region counties are assigned as follows: Harris (Tier 4); Chattahoochee and Muscogee (Tier 2); Marion, Talbot and Taylor (Tier 1). All incentives are developed individually based on the merits of the project. Additional local incentives may be available upon qualification of the plan.

Currently Columbus Chamber of Commerce in a strong partnership with Georgia Tech, Columbus State University, the University of Georgia, local businesses and the Valley Partnership is planning to establish a new incubator facility. Columbus State University offered to build the incubator on the CSU campus in conjunction with the Sales Institute and Conference Center. This new facility will create an environment where technology based companies can grow and will have the resources that will help them to succeed.

6.5 Summary

The analysis of economy and state of technology in the area has shown that Columbus region has undergone a major transition from being textile-oriented county to becoming regional data processing center. Region's real output in computer and data processing services reached \$230 million by 1998 (in 1992\$). At the same time, employment, while growing in emerging economy sectors, decreased significantly in traditional regional industries. That fact is responsible for 4.8% unemployment rate in the region, which is higher than both Georgia's (3.7%) and national (4.0%) average.

Labor force analysis shows that region has some potential in providing skilled labor for further growth of high-tech industry. This conclusion based on the fact that six universities located in the area plus a number of institutions provide people with professional training and associate degrees. However, current share of population with higher level of education in the region is lower than Georgia's and national levels. Additional worries arise from the low quality of education provided by public schools in the county. Students in the region score below national average on SAT scores. This may be a source of potential problems since data processing industry employs a high share of qualified blue-collar workers such as data entry specialists.

Columbus region provides an attractive environment and well-developed infrastructure for those who like smaller communities. Columbus Chamber of Commerce is a proactive institute of collaboration and works a lot on promoting and supporting entrepreneurial activities in the region. Nevertheless, efforts to support entrepreneurial start-ups in the region should be expanded further. There is lack of venture capital in the region.

Overall, Columbus region experiences a strong growth in high-tech industry output. But the biggest challenge now is to sustain this growth. It can be done by building strong clusters around anchor firms located in the region, attracting venture capitalists, improving regional public education system. Attracting new businesses with different

orientation will help to increase industrial diversity and avoid overspecialization in the region.

7. Cork and Columbus benchmarking

This benchmarking is being undertaken to establish common and distinct features associated with technological growth in regions formed around two mid-cities. These regions share a number of similar characteristics in population size, industrial structure, and technological orientation. Both areas located at moderate distance from bigger metropolises and have comparative higher educational facilities.

It has been noted already that to sustain technological growth region should provide conditions that either attract already established high-tech industries to the area or enhance new start-ups. Such conditions include: access to a trained/educated workforce, presence of higher educational facilities and research institutions, availability of venture capital and well-developed infrastructure. In this chapter, Cork and Columbus regions are to be examined through the prism of those features.

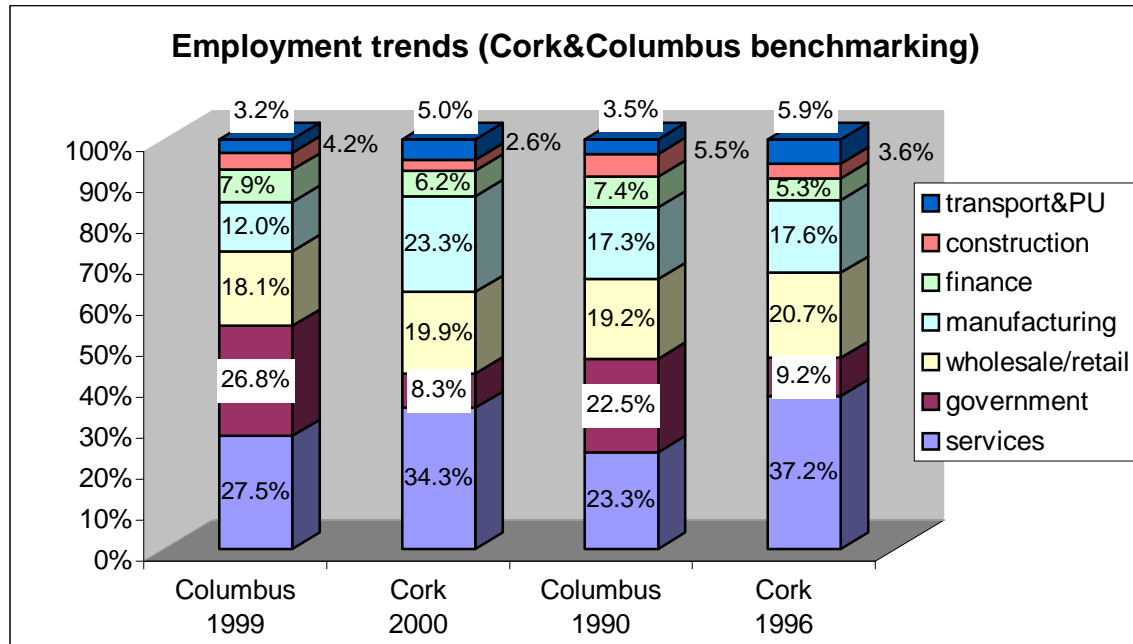
7.1 Economic outlook

Both regions experienced a sustainable growth in employment and industrial output during past several years. However, if Cork region was emerging at the same speed as the rest of Ireland's economy and sometimes even faster, Columbus region was lagging behind both Georgia's and national levels. On the other side, the fact that Cork's net industrial output increased by almost 370% during the period from 1990 to 1998² at least partially can be explained by its initial low level.

More differences in two region's paths can be found by looking at their employment trends (see Figure 7.1). While manufacturing and repair employment in the City of Cork increased by 47% thanks to expansion of software development and systems engineering, Columbus region experienced a significant decrease in this category due to closeouts of textile mills.

² See chapter 4.1 for more details

Figure 7.1



Source: Columbus Chamber of Commerce³, Cork City Development Board

For Columbus, two areas in which significant employment growth was established are represented by Services and Government sectors. Huge differences between two regions in government employment can be explained by presence of military base in Columbus area. As for Columbus region's Services sector, Business Services and Health Services accounted for over 65% of the employment in this area. Engineering and Management Services responsible only for 4.3% of total Services employment. This shows that Cork City managed to utilize its technological potential better than Columbus.

7.2 Availability of educated workforce

One of the most important factors for attracting technology-based companies in the area is availability of young and well-educated workforce. Not only college graduates form such labor force but also well-trained blue-collar workers. To satisfy these requirements region has to develop a chain of universities and other educational facilities, which will provide variety of training programs.

Workforce analysis of both regions gives an impression that both examined areas have a good potential in providing high-tech firms with skilled labor. However, Cork seems to have a bigger share of population with higher level of education than Columbus (19.5% against 15.6%). In this aspect, Cork region is not lagging behind national level while Columbus does. Besides, Ireland's public education considered being very competitive, which cannot be sad about Columbus. On the other hand, significantly bigger number of students currently enrolled in universities located in Columbus region than in universities located in Cork (~38 thousands against 21 thousand), probably the region just can not

³ Chattahoochee County was not included in those figures, because Fort Benning has an impact on its employment structure.

provide graduates with insentive to stay in the area. Diversification of business environment could help Columbus region to keep its graduates home.

7.3 Policies and infrastructure that encourage R&D

Research and development activities in both regions are mainly concentrated around higher education institutes. Both regions have a number of programs and institutions focused on providing incubation space, technological and consultancy services for emerging technology-based businesses.

Cork City hosts four Programmes in Advanced Technology centers, which focus their work on sophisticated manufacturing technology, biotechnology, electronics and telecommunications. University College Cork in close partnership with University of Limerick, UCG, private sector and Enterprise Ireland developed Technology Transfer Initiative. This project will support the development of indigenous industry. New National Software Centre in Mahon was opened in fall 2001 in addition to existing Business Innovation Centre.

Universities located in Columbus region concentrate their research efforts on biotechnology, pharmacology, agriculture, composite materials, textiles, systems for atomic and space power applications. The Center for Business and Economic Development at Georgia Southwestern State University provides support services to existing and potential business, economic development agencies and local governments in the area. To create an environment where technology based companies can grow a new incubator facility is to be established on the Columbus State University campus.

Data gathered on regional R&D investment does not give a basis for good comparison. Although, it is known that business expenditure on R&D in Cork City amounted for £8,123,200 in 1997, at the same time Auburn University alone spent on R&D \$72,528,144. Such big difference and the fact that in Ireland most R&D activities are funded by business leads to conclusion that Columbus region spends much more on its R&D than Cork region does.

Knowledge-based industries require well-developed infrastructure including traditional roads, air and rail network and telecommunication. This analysis shows that both regions enjoy favorable geographical location and provide competitive infrastructure on the national level. However, national level of Ireland is somewhat lower than those of the US. Ireland overall has traditional infrastructure below European standards. In addition, existing broadband technology in Cork is inadequate for existing needs. This brings a conclusion that in terms of well-developed infrastructure Columbus has competitive advantage over Cork.

7.4 Venture Capital and programs supporting start-ups

Analysis shows that venture capital is underrepresented in both regions. But while in Ireland this type of business is relatively immature and Cork region is no exception, in the US, venture capital has a big history and Columbus needs to put more effort in

attracting venture capitalists in the area. Both regions have a number of programs promoting start-ups, but Cork region has a lead in these activities.

There is nothing known about local tax incentives for start-up companies in observed regions. But companies that want to establish their business in Columbus region are eligible for incentives program provided to new companies by the State of Georgia. Ireland, in its turn, is about to lower business tax for local companies to the 12%.

7.5 Summary

The analysis presented above shows that the process of building an information society in Cork, Ireland and Columbus, US has had at least certain common features. Table 7.1 lists a set of variables that supposed to influence the development of regional high-tech industries. Those factors are divided into three groups: public policy, comparative location benchmarking and social infrastructure development. Each feature has been ranked in accordance with its presence in the region.

Table 7.1

High-tech development factors	Cork	Columbus
<i>Public policy</i>		
Tax incentives	No local tax incentives	No local tax incentives
Venture Capital	Limited	Limited
Commercialization of ideas	Hosts four PAT centers	Auburn University has technology transfer procedures
<i>Comparative Location Benchmarking</i>		
Educational Institutions	Competitive	Competitive
Skilled/Educated Labor Force	Good supply	Good potentially but moderate at present
Transportation Center	Advantages: Important seaport; airport (third largest in the country). Disadvantages: bad road quality	Airport, close proximity to Atlanta's airports; good roads.
Broadband Technology	Does not support current needs	Well-developed
<i>Social Infrastructure Development</i>		
Re-education and Training Facilities	Presented	Presented
Quality of Life	Competitive	Competitive

Important conclusions can be drawn by looking at the table above. Both regions need to develop better public policies focused on supporting start-up companies. Interactions between public and private sectors are crucial for development regional high-tech

clusters. Availability of venture capital is essential for promoting entrepreneurial activities. In addition, Cork region needs to focus its activities on renewal of its current broadband technology, while Columbus should concentrate on improving its public education system and programs that could attract university graduates to stay in the region.

8. Conclusion

This study aimed to analyze two regions through the prism of the most important factors that help to enforce entrepreneurial processes and establishing regional high-tech clusters. Examined regions share a number of similar characteristics in population size, industrial structure, and technological orientation. Both areas located at moderate distance from bigger metropolises and have comparative higher educational facilities. First region is formed around City of Cork, Republic of Ireland and the second one located in the United States right on the border of Georgia and Alabama. Columbus is a center of this region.

It can be concluded that the high-tech sectors are the main source of output and employment growth in the economy of both regions. In particular, looking at the total growth in Cork manufacturing employment, one can say that increase in region's manufacturing employment is a result of the increase in employment of technology oriented firms. On the other hand, only increase employment in data processing sector employment helped compensate job losses due to closure of textile mills. Therefore, for regions to sustain its growth over the long-term it is necessary to increase investments in the "raw materials" attributes of innovative technology, i.e. researchers, research expertise, innovation capability of firms.

The analysis has shown that the support of information society is a highly complex process in which different kinds of factors influence the actual outcomes. We are not dealing only with the implementation of new information and communication technologies or with creation of new economic activities or job opportunities. We are rather dealing with an overall societal, political and cultural process in which various kinds of technical, institutional and social innovations interact with each other.

The data examined revealed a number of features that need to be addressed by public officials in both regions. Whether it outdated broadband technology in Cork City or poor state of public education in Columbus, those problems should not keep regions from further development. High-trust relations between different societal actors, continuously strengthening social capital and a certain amount of social cohesion combined with innovative socioeconomic strategies are evidently needed in order to carry out the process of transformation into high-tech economy effectively.

However, in spite of all its importance high-tech economy does pose risk for metropolitan areas. Technology-driven economic development is causing a widening of income disparity along educational attainment levels, reducing job security and job tenure, and may enhance the growth of sustainable unemployment in the region. Public analysts from both examined regions pointed out this fact. Some knowledge-based industries are very

sensitive to recessions. As a result, overspecialized regions can be at bigger risk than those with diverse business structure. All those problems are important and may be addressed in future research.

References:

- 1) Esmond Birnie and David Hitchens, “New economic strategies in Northern Ireland and the Republic of Ireland: Strategy 2010 and enterprise 2010”, Regional Studies; Cambridge; Nov. 2000
- 2) Mary O’Sullivan, “The sustainability of industrial development in Ireland”, Regional Studies; Cambridge; May 2000
- 3) Barry Came, “The Celtic Tiger”, Maclean’s; Toronto; Aug. 2000
- 4) William Crotty, “The changing face(s) of Ireland”, Policy Studies Journal; Urbana; 2000
- 5) Sean O’Riain, “The flexible developmental state: Globalization, information technology, and the “Celtic Tiger”, Politics & Society; Stoneham; June 2000
- 6) David E Schmitt, “Internationalization and patterns of political change in Ireland”, Policy Studies Journal; Urbana; 2000
- 7) Manuel Castells, “The rise of the network society”, second edition, Oxford: Blackwell Publishers, 2000
- 8) Marcel Cote and Roger Miller, “Growing the Next Silicon Valley”, DC Heath; Lexington, 1997
- 9) Joel Kotkin and Ross C. DeVol, “Knowledge-value cities in the digital age”, Milken Institute, 2001
- 10) Ross C. DeVol, “America’s high-tech economy. Growth, development and risks for metropolitan areas”, Milken Institute, 1999
- 11) Columbus Chamber of Commerce, “Economic Profile: economic, demographic, and labor force analysis”, prepared by Market Street Services, Inc, 2001
- 12) Cork City Development Board, “Cork City. Analysis of present economic, social and cultural situation”, 2001, http://www.corkcorp.ie/ccdb/progress_reports.html
- 13) Frank Barry, “Foreign direct investment, cost competitiveness and the transformation of the Irish economy”, Development Southern Africa, Volume 17, 2000
- 14) Michael L. Thurmond, “Dimensions. Measuring Georgia’s workforce”, Georgia Department of Labor, 2001
- 15) Michael E. Porter, “Clusters of Innovation Initiative. Atlanta/Columbus”, Council on Competitiveness Monitor Group, on the FRONTIER, 2001
- 16) Irish Council for Science, Technology and Innovation, “Statement”, <http://www.forfas.ie/icsti/statements/>
- 17) Columbus Chamber of Commerce, WebPage, <http://www.columbusgachamber.com>
- 18) Auburn University, <http://www.auburn.edu>
- 19) Columbus State University, <http://www.colstate.edu>
- 20) Georgia Southwestern State University, <http://www.gsw.edu>