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Industry Cluster Analyses for Capital Region Planning and Development District and the North Delta Regional Planning & Development District, Louisiana, USA

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ABSTRACT: Louisiana Vision 2020 and long-term strategic plans support industry clusters-based investment strategies to stimulate regional economic development. The state offers various forms of incentives including tax credit on investment, or job creation, sales and use of tax exemptions to attract new investments and startups and support small business growth and expansion. To take advantages of these programs, the state regional planning and development districts have identified target industry clusters as pillar for economic development through Comprehensive Economic Development Strategies. The Capital Region Planning Commission has identified seven mature target-industries and three emerging industries for the Capital Region Planning and Development District. The seven clusters include chemicals and new energy production; fabricated structural metals; software design; technical research & consulting; advanced shared services; and agribusiness, food processing & technology. The three emerging sectors are health care, film production & entertainment services, and emerging fuel sectors & renewable energy. The targeted industry clusters in the North Delta Regional Planning and Development District include heath care, retail trade, education services, manufacturing, and tourism. In this study, I use location quotient and shift share analyses to compare respectively, the concentration of employment in the two planning districts to the concentration of employment in the same cluster nationally and to highlight the uniqueness of a regional economy. In both districts, most of the target industries are industry cluster that are unique to the regions. However, their growths depend on national trend and have no regional comparative advantage. While these results may be an indication of structural shift from an economy dominated by declining clusters to one dominated by emerging industry clusters, the policy and education systems will need to develop the capacity to accommodate anticipated labor mobility and to provide a sustainable labor needs in the high growth and emerging industries.

Keywords: *Industry Cluster, Location Quotient, Louisiana, Planning Districts, Shift-Share*

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INTRODUCTION

The University Center for Economic Development at Southern University and A&M College collaborates with the planning commissions for the Capital Region Planning and Development District and the North Delta Regional Planning & Development District to stimulate regional economic development in the two districts. One of the Center's activities is conducting applied research that supports Louisiana Vision 2020, the mission of the Louisiana's long-term strategic plans and the two district's goals and objectives. Louisiana's Vision 2020 and long-term strategic plans embodies industry clusters-based investment strategies to stimulate regional economic development. According to the Louisiana's Economic Development Department, there are several state sponsored programs, incentives and initiatives for industrial recruitment, entrepreneurial and small business development, and business retention and expansion. These programs include Faststart®, a free workforce-training program that recruits and train potential job seekers for specific companies. The Angel Investor Tax Credit program, grants up to a 35% tax credit for individual investors who invest in early stage, wealth-creating businesses that seek start-up and expansion capital. The Competitive Projects Payroll Incentive Program provides an incentive rebate of up to 15 percent of a participating company's new payroll for up to 10 years.

Other programs provide various forms of incentives including credit on investment and/or job creation through sales and tax exemptions. The Quality Jobs Program allows up to 6% rebate on annual payroll expenses for up to 10 years, coupled with either a 4% sales/use tax rebate on capital expenses or a 1.5% investment tax credit for qualifying expenses. The Digital Interactive Media and Software Development Incentive program affords a 35% tax credit for in-state labor and 25% credit for eligible production expenses. The Research and Development Tax Credit gives a tax credit up to 40% to existing businesses with operating facilities in Louisiana to establish or continue research and development within the state. The Enterprise Zone programs provides a $2,500 tax credit for each certified net, new job created and either a 4% percent sales/use tax rebate on capital expenses or 1.5% refund on capital investment. The Restoration Tax Abatement is a five-year 100% property tax abatement program for the rehabilitation of an existing structure. The Industrial Tax Exemption programs is a 100% property tax abatement for up to 10 years on a manufacturer's new investment and annual capitalized additions. The Sound Recording Investor Tax Credit program permit a 25% refundable tax credit for qualified production expenditures on state-certified sound recording projects. The Motion Picture Investor Tax Credit programs provides a 30% transferable tax credit for qualified production expenditures and an additional 5% payroll tax credit for in-state labor. The Technology Commercialization Tax Credit allows a 40% refundable tax credit for companies that invest in the commercialization of Louisiana technology and a 6% payroll rebate for the creation of new, direct jobs. The Musical and Theatrical Production Tax Incentive confers 25 to 35% tax credit on qualified production or infrastructure development expenses with additional tax credits available for payroll and transportation.

Several other programs, incentives and initiatives specifically support small businesses from entrepreneurial startups to small business growth and expansion. The Small Business Loan and Guaranty Programs afford loan guarantees to banks and other small business lenders in association with the U.S. Department of Treasury's State Small Business Credit Initiative (SSBCI)

ranging from $5,000 to $1.5 million. The Economic Gardening Initiative provides customized core business strategies, market research, qualified sales leads and improved internet and technology tailored to enterprise growing needs. The Small and Emerging Business Development Program permits development assistance, including entrepreneurial training, marketing, computer skills, accounting, and legal and industry-specific assistance. The Hudson Initiative is the certification program offering greater access to purchasing and contracting opportunities at the state government level. The Veteran Initiative helps veteran-owned and service-connected disabled veteran-owned small businesses to gain greater access to purchasing and contracting opportunities at the state level.

To take advantage of these programs, incentives and initiatives, two of the general goals of the two Comprehensive Economic Development Strategies (CEDS) are enhancing regional collaboration to promote economic development and improving education and workforce development skills to foster a more diverse economy that meet the needs of both existing and emerging industries and technologies. Among prioritized activitities include identifying and supporting new and emerging industries through industry cluster and value chain analyses, establishing greater opportunities for entrepreneurism and business development in collaboration with the region's universities, community colleges, and vocational schools and working with existing industries to indentify workforce needs and deficiencies. To achieve these objectives the Capital Region Planning Commission has identified seven mature target-industries and three emerging industries for the Capital Region Planning and Development District. The seven clusters include chemicals and new energy production; fabricated structural metals; software design (enterprise, industrial, and gaming applications); technical research and consulting; advanced shared services; and agribusiness, food processing & technology. The three emerging sectors are health care, film production and entertainment services, and emerging fuel sectors and renewable energy. The 2010/15 Comprehensive Development Strategy for the North Delta Regional Planning & Development District identifies five target-industries including heath care, retail trade, education services, manufacturing, and tourism. Targeting metrics are national and local employment growth, industry output, concentration in the region, and alignment with regional labor and infrastructure assets. Targeting specific industries for economic development is as an employment generation strategy in the region.

One of the studies developed by the Center is on Occupation and Industry Cluster Analyses. The aims of the study are to enhance regional collaboration by promoting economic development and supporting the achievement of the CEDS's goals by profiling the two region economies and identifying mature, growing, and emerging industry clusters. The general objectives are mapping the regional economic base and establishing existing inter-linkages. Specific objectives are: 1) capture and maintain inventory of assets, resources, incentives, and socioeconomic data of the regions; 2) identify new and emerging industry sectors; and 3) identify workforce development needs and deficiencies to support new and emerging industry sectors. This study is focusing on specific objective number two on industry cluster analyses that map the existing economic landscape. Policy makers and planners in the two districts will use the reports to refine public policies, formulate targeted investment, and development short and long-term plans to support mature, growing, emerging, and shrinking industry clusters.

LITERATURE REVIEW

According to Porter (2003) a cluster is a group of companies sharing local resources, using similar technologies, and forming linkages and alliances. These linkages can take the form of buyer-supplier relationships, turnover and pirating of employees, joint marketing, training, or research initiatives, associations, and lobbying. An industry cluster therefore represents the entire value chain of a broadly defined industry from suppliers to products, including supporting services and specialized infrastructure (Manning, 2008). The flow of goods and services inter-connect industries within a concentrated regional cluster and is stronger than the flow of goods and services linking them to the rest of the economy (Guo and Guo, 2011). The purpose of industry cluster analysis is therefore to identify those areas of the economy in which a region has comparative advantages and to develop short and long-term economic development strategies (Lammarino and McCann, 2006). One of the unique features of cluster analysis is the focus on linkages between firms and on implications for shared strategies in which companies selectively compete in some respects (e.g., output markets) yet cooperate in other respects (e.g., joint training programs).

The commonly used ratios in industry cluster analyses are the location quotient and the shift-share (Delgado, Porter and Stern, 2010). A location quotient ratio compares the concentration of employment in a regional industry cluster to the national level concentration of employment in the same cluster (Ketels, 2013). Generally, an industry cluster with location quotient of greater than 1.2 suggests that it has a regional competitive advantage. The cluster is producing goods or services in excess of the regional consumption and exporting the excess to other regions (Feldman, Francis and Bercovitz (2005). The location quotient (LQ) ratio formula is:

$$LQ = \frac{e_i / e}{E_i / E}. \quad (1)$$

In Equation (1), e_i is the regional employment in industry i in Year t, e is the total regional employment in year t, E_i is the national employment in industry i in year t, and E is the total national employment in year t. Therefore, the location quotient method compares regional employment to national employment.

Combined with employment growth rate, the LQ identifies mature, high growth, and emerging industries (Moineddin, Beyene and Boyle, 2003). Mature industry clusters are those that have high concentrations (LQ > 1.2), but are associated with negative employment growth rate. These industries may have or used to have competitive advantage in the region, which is declining over time. These industry clusters still have strong employment concentrations regionally, but need careful attention to ensure that they have the necessary resources to retain or expand employment. High growth industry clusters are those that have both a high concentration (LQ > 1.2) and have positive employment growth rate. These industry clusters have strong competitive advantage and show potential for growth. Emerging industry clusters show positive employment growth but the LQ is less than one. These clusters show a potential for growth, but do not necessarily represent a strong competitive advantage in the region. These industry clusters may require additional infrastructure or incentives to continue their growth. Declining industry clusters have LQ that is less than one and are experiencing negative job growth (Markusen et al., 2008).

A shift-share ratio is similar to a location quotient ratio in that it highlights the uniqueness of a regional economy, but it does so in terms of job growth rather than total jobs in an industry. It paints a picture of how well the region's current industries are performing by systematically examining the national, regional and industrial components of employment change. A value of the shift-share approximates a dynamic account of total regional employment growth that is attributable to growth of the national economy, a mix of faster or slower than average growing industries, and the competitive nature of the local industries (Mitchell and Carlson, 2005). It decomposes employment changes within an economy over a specified period into three mutually exclusive factors. The share of regional job growth attributed to growth of the national economy; the share of regional job growth attributed to the regional's mix of industries; and share of regional job growth that describes the extent to which factors unique to the region have caused growth or decline in regional employment (Mondal, 2009)

The first component (national growth effect) means that if the nation as a whole is experiencing employment growth, it will exert a positive influence on the regional job growth. This component describes the expected change by virtue of the fact that the regional economy is part of a changing national economy. The component is for estimating the number of additional employment in the cluster had the regional employment followed the national growth for all sectors. The component therefore measures regional employment change that would have occurred if a specific industry cluster's employment in the region had grown at the same rate as the national industrial growth rate. This measure holds the employment shares in the regional industry constant (Nasara and Hewings, 2004).

The second component (industry mix effect) isolates the fact that nationwide, some industry clusters have grown faster or slower than others. It represents a contribution attributed to a national industry cluster to the change in the number of jobs in the regional industry cluster. The component estimates jobs created/not created in each industry due to differences in industry and total national growth rates. It is the share of regional employment change attributed to the local industry mix and reflects the degree to which the region specializes in industries either growing fast or slowing nationally. A region with many industries that are growing fast nationally will have a positive industry mix effect whereas a region with a concentration of industries that are declining nationally the industry mix effect is negative. The sum of the national growth effect and industrial mix effect is the expected growth change. It is the expected job growth in the regional industry cluster if it exactly follows national trends. The ratio is for estimating the total regional employment of the industry assuming that the region is growing proportionately to the national growth rate (Hassan, Rashid and Hamid, 2011).

The third component (region share effect) is due to local comparative advantage associated with regional natural resources, linked industries, or favorable local labor situations. It is used to estimates the number of additional regional employment due to regional specialization and local factors. The component shows the change in regional employment due to differences between the regional industry cluster growth (decline) rate and the industry cluster's national growth rate. The regional share shows how significantly the growth rates vary from one region to another (Sakashita, 1973). It identifies local area's economic strengths and represents the region's competitive position towards contributing to regional job growth. In particular, the

local share component points to industries that enjoy local comparative advantage. Industries with high regional competitiveness effects highlight the region's competitive advantages or disadvantages. The local shift share shows the number of jobs created/not created because of the region's competitiveness. It identifies the region's leading and lagging industries.

Sum of the industry mix effect and local share effect is the net variation in total employment not predicted by the national share (i.e., total regional shift). The three components together should add to the absolute change in employment in the region. The formula for estimating the three components is:

$$\Delta E_{ir} = NS_{ir}^{t} + IM_{ir}^{t} + RS_{ir}^{t}, \quad where;$$
$$NS_{ir}^{t} = E_{ir}^{t-1}\left[\frac{E_{us}^{t}}{E_{us}^{t-1}} - 1\right], IM_{ir}^{t} = E_{ir}^{t-1}\left[\frac{E_{i,us}^{t}}{E_{i,us}^{t-1}} - \frac{E_{us}^{t}}{E_{us}^{t-1}}\right], RS_{ir}^{t} = E_{ir}^{t-1}\left[\frac{E_{ir}^{t}}{E_{ir}^{t-1}} - \frac{E_{i,us}^{t}}{E_{i,us}^{t-1}}\right]. \quad (2)$$

In Equation (2) Δ***E*** is the actual change in employment for the region. The symbol ***E*** represents number of employment, ***NS*** is the national share component, ***IM*** is the industry mix component, and ***RS*** is the regional shift component. The subscript ***i*** is the specific industry, ***r*** is a specific region, ***t*** is current period, ***t-1*** is the past period, and ***us*** is the reference region. All three components in Equation (1) are positive for clusters that are growing nationally and have national competitive advantage. If the industry mix component is negative and the national and local shares are positive, industries in the cluster are declining nationally but have a regional competitive advantage. If the local share is negative and the other two components are positive; then, industries in the cluster are growing nationally but are not regionally competitive. If both the national share and the industry mix are negative and the regional shift is positive; then, the cluster is growing regionally and an indication that the region may have some comparative advantage in these industries due natural resource advantage (absolute productive advantage).

DATA SOURCE

The primary source of information on employment by industry is from the StatsAmerica website at http://www.statsamerica.org. The data available for industry cluster analysis constitute 17 clusters across the United States and allows combining individual counties to defined custom regions. The aggregated industry clusters use the three-digit NAICS sectors classification that minimizes the problems caused by data suppression in a more-detailed NAICS levels. Six sub-clusters for the manufacturing super cluster produce the following products: primary metals; fabricated metal products; machinery; computer and electronic products; electrical equipment, appliance and components; and, transportation equipment.

The analysis uses a three-point 2002, 2007, and 2012 as the latest employment data available is for 2012. The five-year interval is optimal in terms of capturing potential structural change in the economy. The first aggregated data includes all parishes served by the Capital Region Planning and Development Commission (Region 2) and the second aggregation data includes all parishes in the North Delta Regional Planning & Development District (Region 8) and Concordia Parish, which is included in the Center's outreach program. The eleven member parishes in the Capital Region Planning and Development Commission are Ascension, East Baton Rouge, East Feliciana, Iberville, Livingston, Pointe Coupee, St. Helena, Tangipahoa, Washington, West Baton

Rouge, and West Feliciana. The eleven member parishes in the North Delta Regional Planning & Development District are Caldwell, East Carroll, Franklin, Jackson, Madison, Morehouse, Ouachita, Richland, Tensas, Union and West Carroll. The Concordia Parish links the two regions along the Mississippi river corridor (Appendix 2).

RESULTS AND DISCUSSION

LOCATION QUOTIENT AND EMPLOYMENT CHANGE

Capital Region Planning and Development District

Table 1 shows the data on number of employees used for cluster data analysis and associated results related to percent change in employment and estimated Location Quotient by industry cluster for the Capital Region Planning and Development District. Results in Table 1 indicate that the total number of employee was 212,411 workers in 2002, which increased by 9% in 2002/07 and decreased by 5% in 2007/12. For the three data points, the location quotient was 0.84 on average. In 2012, the biomedical/biotechnical (life sciences) cluster was the first tier employer (more than 20,000 employees), followed by energy, business & financial services clusters, education and knowledge creation, and defense and security (Table 1). The five clusters employed 61%, 66%, and 67% of the regional employees in 2002, 2007, and 2012 respectively. However, only the energy and education & knowledge creation clusters had location quotients above 1.2 in 2012. The location quotients for the biomedical/biotechnical, business & financial services and defense & security clusters were close to one, indicating that the cluster just met its regional demand for goods and services produced by these clusters. The five clusters experienced positive employment growth in 2002/07. Except for the education and knowledge creation cluster that grew by 7% in 2007/12, the remaining clusters experienced a decline in employment. The defense & security cluster was the worst hit and declined by 14%.

The second tier employers (10,000-20,000 employees) in 2012 were entertainment, recreation & visitor, advanced materials, transportation & logistics, and chemicals & chemical based products clusters. In 2002, 2007 and 2012, the four clusters employed 25%, 21%, and 21% of the regional total employees. Among the four clusters, only the chemical & chemical based products cluster had location quotients greater than 1.2 for the three data points. However, the employment in this cluster decreased by 15% in both periods. The location quotient for the transportation & logistics cluster was 1.17 in 2002 but declined to 0.99 in 2007 and slightly increased 1.01 in 2012. Employment decreased by 5% in 2002/07 and by 2% in 2012. For the arts, entertainment, recreation & visitor cluster, the location quotient was 0.75 in 2002, 0.77 in 2007 and 0.84 in 2012 that indicate instability in employment growth. The cluster's employment increased by 14% in 2002/07 and 6% in 2007/12 periods. The location quotients for the advanced materials manufacturing were around one for the three data points and employment consistently decreased overtime (by 14% in 2002/07 and 9% in 2007/12). In general, all clusters in this tier, experienced a decline in employment especially during the 2002/2012 period were the decline ranged from 5% (transportation & logistics cluster) and 14% for arts, entertainment, recreation & visitor cluster and advanced materials manufacturing cluster; to 15% (chemicals and chemical products clusters).

Table 1: Results for the Capital Region Planning and Development District

Cluster	Employees in hundreds			% Change		Location Quotient		
	2002	2007	2012	2007	2012	2002	2007	2012
Biomedical/Biotechnical	323	395	393	22%	-1%	0.99	1.04	0.96
Energy (Fossil & Renewable)	332	366	347	10%	-5%	2.17	2.18	2.06
Business & Financial Services	249	299	289	20%	-4%	0.87	0.89	0.87
Education & Knowledge Creation	187	208	223	11%	7%	1.58	1.53	1.58
Defense & Security	195	233	201	19%	-14%	1.13	1.19	0.98
Entertainment & Recreation	102	117	123	14%	6%	0.75	0.77	0.84
Advanced Materials	155	133	121	-14%	-9%	1.02	0.88	1.00
Transportation & Logistics	122	117	114	-5%	-2%	1.17	0.99	1.01
Chemicals & Chemical Products	149	126	108	-15%	-15%	2.19	1.91	2.01
IT & Telecommunications	63	54	54	-15%	0%	0.42	0.37	0.38
Food Processing & Technology	64	55	52	-14%	-5%	0.75	0.63	0.61
Fabricated Metal	39	43	41	9%	-5%	0.97	1.00	1.14
Printing & Publishing	35	42	40	20%	-5%	0.52	0.60	0.68
Forest & Wood Products	58	51	29	-12%	-43%	1.04	0.98	0.84
Apparel & Textiles	16	12	10	-22%	-21%	0.38	0.35	0.53
Primary Metal	6	8	8	36%	-6%	0.44	0.63	1.39
Transportation Equipment	5	11	6	108%	-39%	0.10	0.22	0.18
Mining	3	5	6	69%	19%	0.62	0.88	1.07
Computers & Electronics	4	3	6	-16%	79%	0.09	0.09	0.19
Machinery	10	9	5	-3%	-45%	0.30	0.28	0.22
Glass & Ceramics	6	4	3	-42%	-16%	0.64	0.40	0.47
Electrical & Appliances	1	1	1	6%	21%	0.07	0.08	0.12
Total	2,124	2,291	2,178					
Average				9%	-5%	0.83	0.81	0.87

Source: http://www.statsamerica.org and author's calculation

The third tier employers (1,000 – 10,000 employees in 2012) included six clusters, that is, information technology & telecommunications cluster, agribusiness, food processing & technology cluster, fabricated metal product manufacturing cluster, printing & publishing cluster, forest & wood products cluster, and the apparel & textiles cluster. The six clusters employed 13%, 11% and 10% of the regional employees in 2002, 2007, and 2012 respectively. Only the fabricated metal manufacturing cluster and the forest wood products clusters had location quotients close to one. Location quotients for the remaining clusters were below 0.75

with the location quotient for the information technology & telecommunications cluster being the lowest. All clusters experienced a decreased in employment during the two periods and the worst hit was the forest & forest products (43%) in 2007, apparel & textiles (22%) in 2002/07. The fourth tier employers (less than 1,000 employees in 2012) in order of importance were primary metal manufacturing, transportation equipment manufacturing, mining, computer & electronic product manufacturing, machinery manufacturing, glass & ceramics, and electrical equipment, appliance & component manufacturing. The seven clusters employed about 2% of total employees in the region.

The relationship between location quotients and change in employment for 2002/07 and 2007/12 is as shown in Figure 1.1 and 1.2 respectively. In general, industry clusters in the first quadrant, have a LQ greater 1.2 and experienced increased employment during the period under study. This suggests that the clusters are important to the local economy, with a growing concentration of employment relative to the national economy. Industries in this category may require additional analysis to understand what is driving their growth and how to sustain the attained growth.

The clusters in the second quadrant have LQ that is greater 1.2 and are experiencing declining employment. The results are indicative of clusters that are important to the regional economy but that may be at risk of layoffs, relocation, or other economic disruptions that may require some level of intervention. Industry clusters in the third quadrant have LQ less than 1.2 and employment decreased during the reference period. The industry clusters in the third quadrant are shrinking overtime. The clusters in fourth quadrant have LQ less than 1.2 and recorded positive employment growth. The clusters may not be important now (emerging clusters), but could be a source of future regional economic growth.

Figure 1.1 shows that in 2002/07 the chemical and chemical based products industry cluster (CC) was a mature cluster and energy and education & knowledge creation clusters were growth clusters. Figure 1.1 also shows that there was a group of industry cluster with location quotients between 1.2 and 0.8 and with 2% change (positive or negative) in employment. In order of employment importance, these industry clusters include biomedical/biotechnical (BI), business & financial services (BF), defense and security (DE), arts, internment, recreation & visitor industries (AE), and fabricated metal product manufacturing (FM) in the immerging industry category. The clusters in the declining industry category include advanced materials (AD), transportation and logistics (TR) and forest and wood products (FW). Practically, for these industry clusters, the region had the same proportion of economic activity, as does the entire nation. Apparent emerging clusters with significant employment in 2007 was printing, and publishing (PR). Other emerging industry clusters were primary metal manufacturing (PM), transportation equipment manufacturing (TE), mining (MI) and electrical equipment, appliance and components manufacturing (EE). The declining industries with significant employment were agribusiness, food processing & technology industry cluster (AF) and information technology & telecommunications industry cluster. Other declining industry clusters included apparel and textiles (AP), machinery manufacturing (MA), computer and electronic products manufacturing (CE) and glass and ceramics manufacturing (GL).

Figure 1.1: The Relationship between Location Quotient and Employment Changes for 2002/07 for the Capital Region Planning and Development District

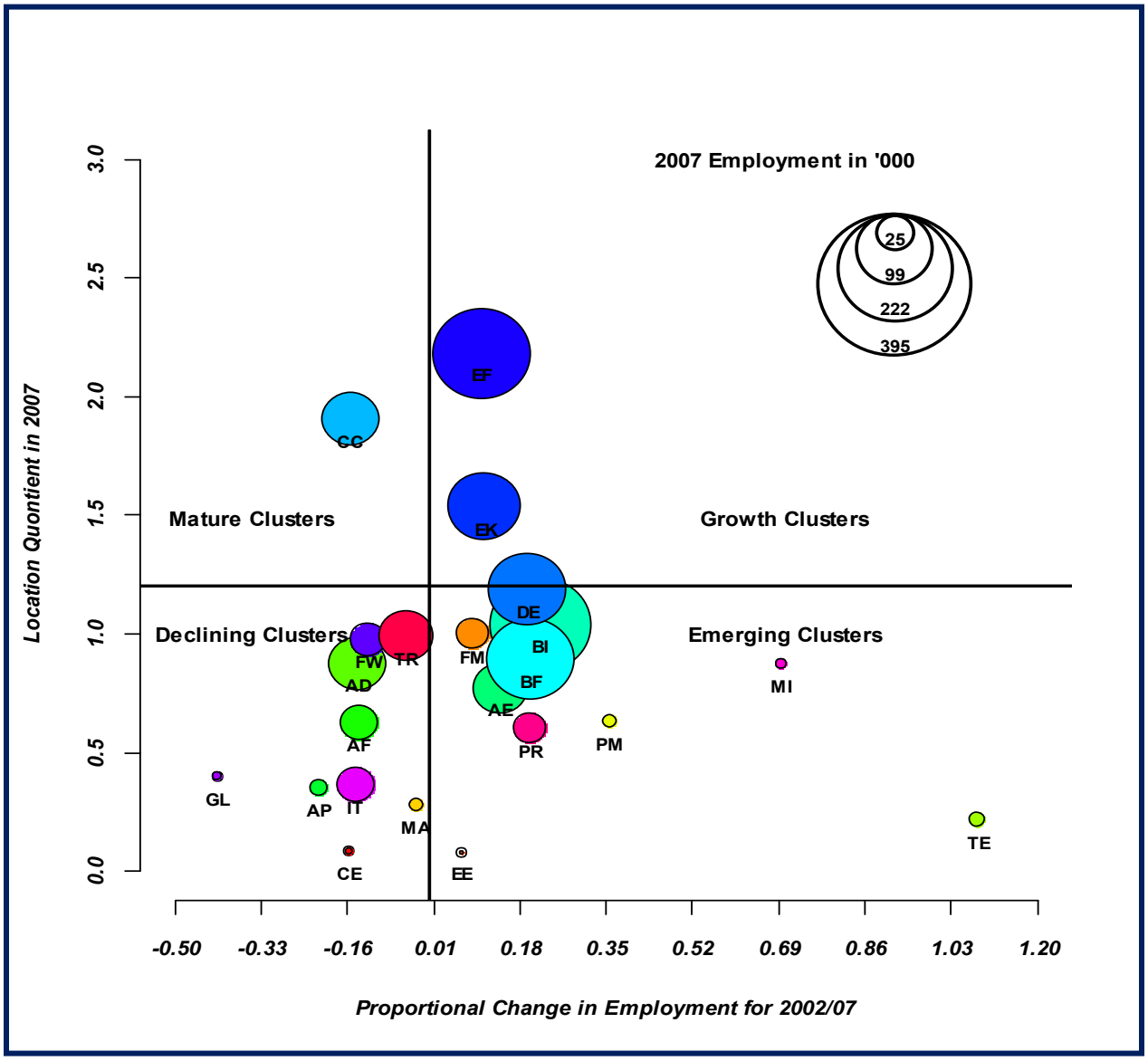
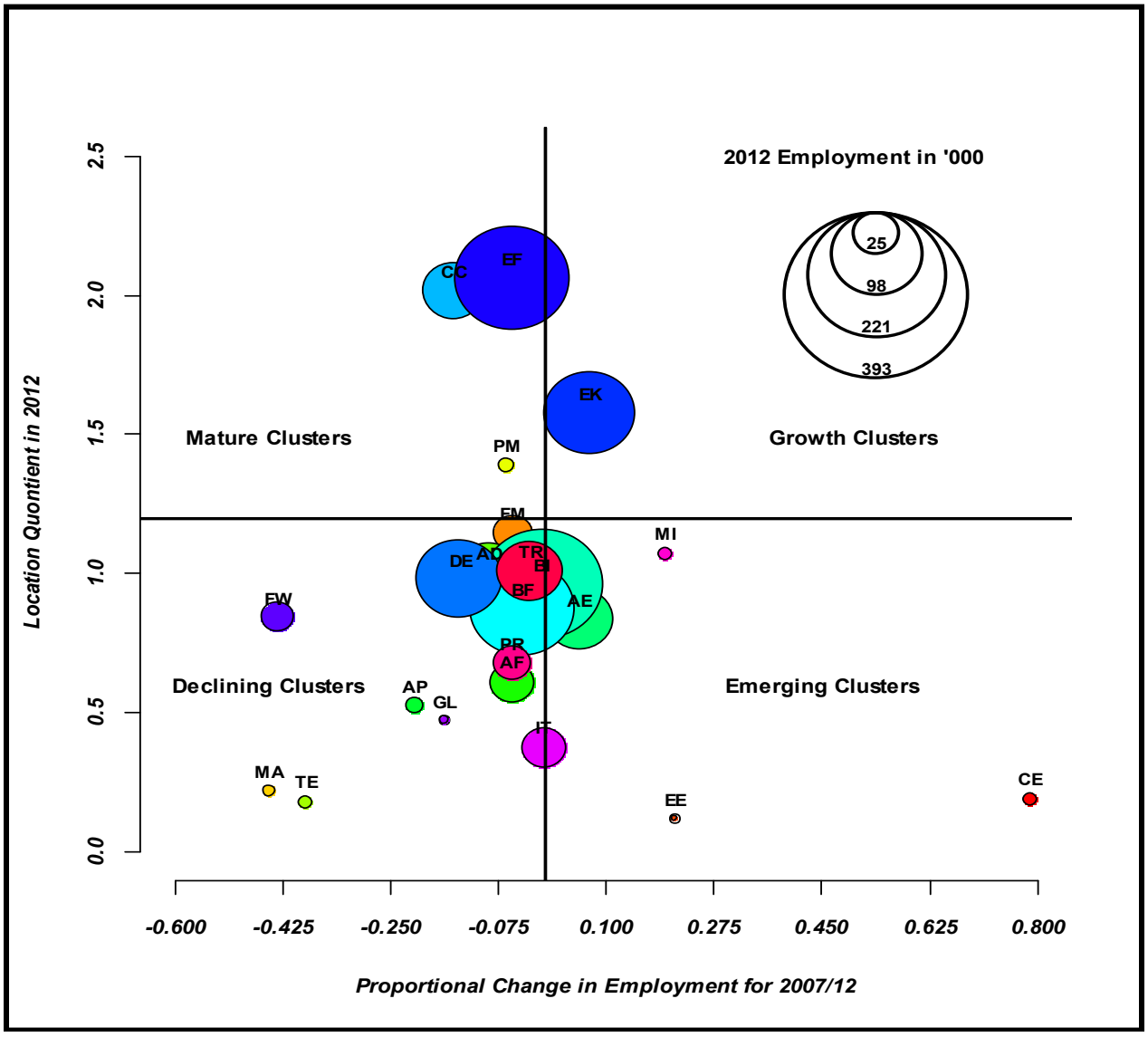


Figure 1.2 shows results for 2007/12 with similar interpretation. Notice that that the Energy industry cluster (EF) moved towards maturity and the education & knowledge creation cluster was moving towards the same direction. In addition, notice the skewing towards declining industry cluster's categories for the group of industry clusters with location quotient between 1.2 and 0.8 and the percent change in employment between -2% and 2%. The primary metal manufacturing (PM) moved from emerging cluster in 2002/07 to mature industry cluster in 2007/12 with insignificant increase in employment. The industry clusters that showed significant decline compared to 2002/07 includes forest and wood products clusters (FW) and machinery manufacturing (MA). The two clusters are showing significant decrease in both concentration and employment. The transportation equipment manufacturing (TE) moved from emerging to declining industry category.

Figure 1.2: The Relationship between Location Quotient and Employment Changes for 2007/12 for the Capital Region Planning and Development District



As indicated above, the targeted industry clusters for the Capital Region Planning and Development District are chemicals and new energy production, fabricated structural metals, software design, technical research and consulting, advanced shared services, and agribusiness, food processing and technology. This is in addition to health care, film production and entertainment services, and emerging fuel sectors. Industry clusters that are showing stability and growth are the chemicals, new energy production and emerging fuel sectors that constitute the chemicals and chemical products (CC) and Energy (EF) clusters. The computer and electronic product manufacturing and (EE) and information technology and telecommunications (IT) that support software design industries were still weak to support a rapid growth of these targeted industries. The agribusiness, food processing and technology industry cluster (AF) that supports food processing and technology shows insignificant growth in both concentration and employment.

Likewise, arts, internment, recreation and visitor industries clusters (AE) that supports the film production and entertainment services industries had insignificant growth in both concentration and employment. The healthcare sector as supported by the biomedical/biotechnology (life sciences) industry cluster had significant number of employees but was relatively at the emerging cluster category. The cluster is showing the sign of declining in terms employment concentration. As well, notice (from Figure 1.1 and 1.2) that the education and knowledge creation industry cluster (EK) may be moving towards a maturity instead of continuous growth. Apart from supporting technical research and consulting and advanced shared services, the clusters is a precursor that creates a pipeline of knowledgeable and skillful workforce that supports the need of mature, growing and emerging industry clusters.

North Delta Regional Planning & Development District

The industries in the region employed 68,169 workers in 2002. The numbers of employees increased by 4% in 2002/07 and then declined by 1% in 2007/12 period. The location quotient for all industry clusters was on 0.89 on average (Table 2). The first tier employer (greater than 10,000 employees) was the biomedical/biotechnical clusters that employed 16,763 employees in 2002, which was 25% of the total employees. The number of employees in this cluster increased by 4% in 2002/07 and decreased by 7% in 2007/12. The location quotients for the three data points were well above 1.2 showing potential for export outside the region.

The second tier employers that employed between 5,000 and 10,000 employees for the three data points included three clusters: business & financial services, energy (fossil & renewable); defense & security; agribusiness, food processing & technology and forest & wood Products clusters. In 2002, 2007, and 2012, the clusters employed 48%, 43%, and 45% of the total employees in the region. The locations quotients for the forest & wood products, agribusiness, food processing & technology, and energy clusters were above 1.2. However, the forest and wood products cluster experienced a continuous decline in employment (by 25%) for the two consecutive periods. For the agribusiness, food processing & technology cluster, there was 3% increase in employment in 2007/12 after employment dip (by 25%) in 2002/07. In 2002/07, employment in the energy cluster increased by 6% and decreased by 8% in 2007/12. The location quotients of the defense and security cluster remained close to one although employment decreased by 5% and 7% for the two-time period. The business & financial services cluster had location quotients of 0.877, 0.731, and 0.894 for the three data points and employment declined by 12% in 2002/07 before increasing by 19% in 2007/12.

The third tier employers (1,000 – 5,000 employees) include education & knowledge creation, transportation & logistics, arts, entertainment, recreation & visitor industries, advanced materials manufacturing, information technology & telecommunications, chemicals & chemical based products, printing & publishing, manufacturing, and fabricated metal product manufacturing. These clusters employed 24%, 27% and 25% of the total employees in 2002, 2007 and 2012, respectively. The education & knowledge creation and advanced material manufacturing clusters experienced a similar trend. The net employment increase in the education & knowledge creation was 38%. The location quotients of the printing and publishing cluster increased from 0.50 in 2002 to 0.70 in 2012. The overall gain in employment for the

cluster in 2007/12 was 15%. Another cluster showing a similar trend was information technology & telecommunications, which has remain stable with location quotient of less than 0.4. The location quotient for the fabricated metal product manufacturing increased from 0.881 in 2002 to 1.445 in 2007 and employment increased from 1,057 to 1,659; a 57% increase. However, the location quotient decreased to 1.026 in 2012 and employment decreased by 42%.

Table 2: Industry Cluster Analysis Results for the North Delta Regional Planning & Development District

Cluster	Number of Employee			% Change		Location Quotient		
	2002	2007	2012	2007	2012	2002	2007	2012
Biomedical/Biotechnical	16,763	17,503	16,309	4%	-7%	1.64	1.66	1.46
Business & Financial Services	7,487	6,590	7,874	-12%	19%	0.84	0.71	0.87
Energy (Fossil & Renewable)	6,080	6,458	5,956	6%	-8%	1.28	1.38	1.29
Defense & Security	6,004	5,692	5,317	-5%	-7%	1.11	1.05	0.94
Food Processing & Technology	5,680	4,243	4,355	-25%	3%	2.15	1.74	1.86
Forest & Wood Products	6,239	4,495	3,484	-28%	-22%	3.60	3.08	3.67
Education & Knowledge Creation	2,357	3,307	3,230	40%	-2%	0.64	0.88	0.83
Transportation & Logistics	3,013	2,494	2,504	-17%	0%	0.93	0.76	0.81
Entertainment & Recreation	2,740	2,733	2,428	0%	-11%	0.64	0.65	0.60
Advanced Materials	1,890	2,468	2,012	31%	-18%	0.40	0.59	0.61
IT & Telecommunications	1,501	1,364	1,453	-9%	7%	0.32	0.33	0.37
Chemicals & Chemical Products	1,982	1,969	1,206	-1%	-39%	0.94	1.07	0.82
Printing & Publishing	1,042	972	1,118	-7%	15%	0.50	0.50	0.70
Fabricated Metal Product	1,057	1,659	970	57%	-42%	0.84	1.40	1.00
Machinery	629	570	554	-9%	-3%	0.62	0.61	0.85
Mining	49	114	269	133%	136%	0.32	0.69	1.70
Transportation Equipment	695	338	239	-51%	-29%	0.45	0.25	0.25
Primary Metal	190	193	202	2%	5%	0.45	0.54	1.33
Apparel & Textiles	558	218	122	-61%	-44%	0.44	0.23	0.24
Glass & Ceramics	126	267	91	112%	-66%	0.42	1.05	0.51
Electrical & Appliances	0	61	49	0%	-20%	0.00	0.18	0.18
Computer & Electronic Product	87	21	43	-76%	105%	0.07	0.02	0.05
Total	**66,169**	**63,729**	**59,785**					
Average				**4%**	**-1%**	**0.84**	**0.88**	**0.95**

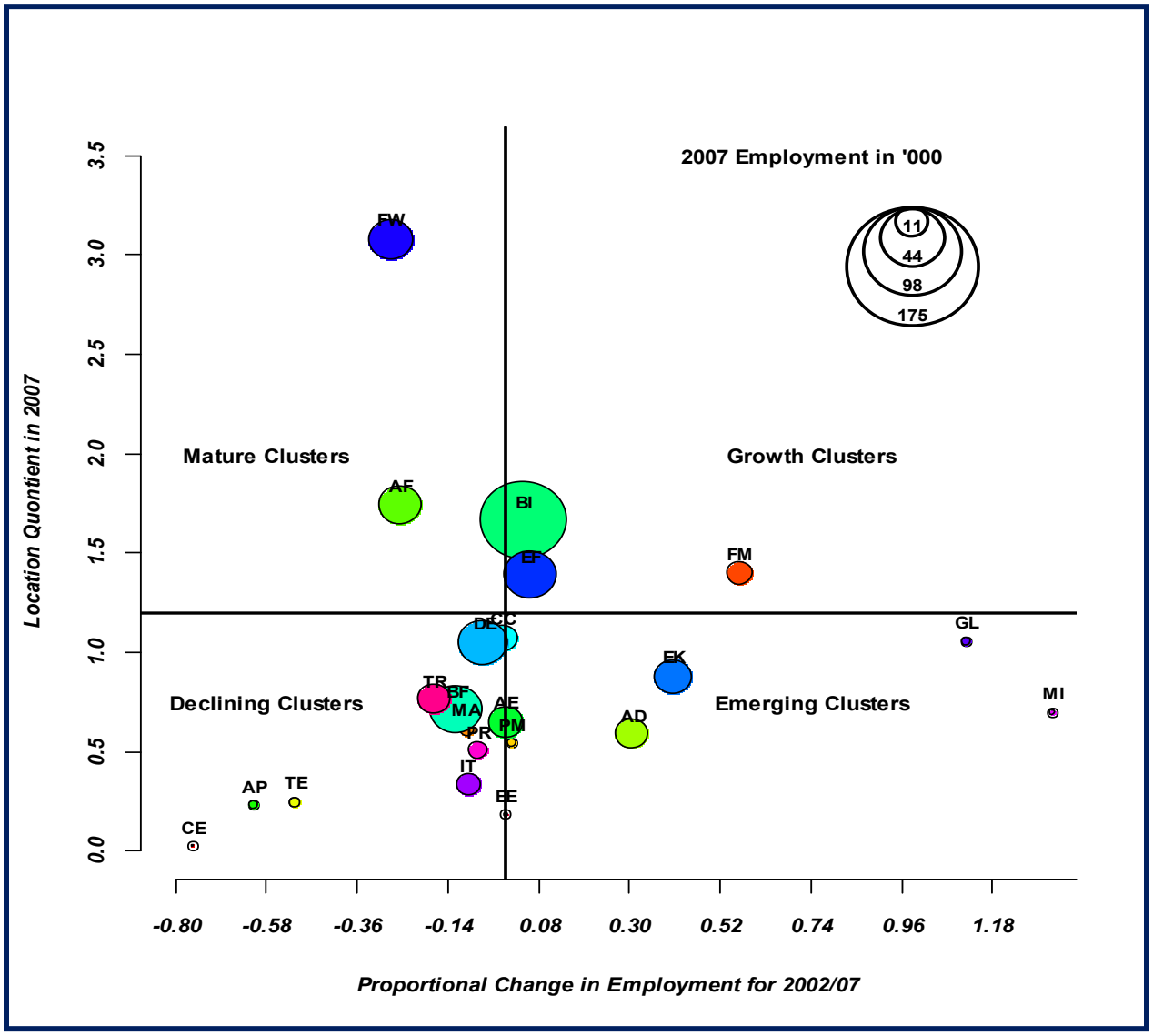
Source: http://www.statsamerica.org and author's calculation

The fourth tier employer (less than 1,000 employees) in order of less importance were computer & electronic product manufacturing, electrical equipment, appliance & component manufacturing, glass & ceramics, apparel & textiles, primary metal manufacturing, transportation equipment manufacturing, mining, and machinery manufacturing. On average, the clusters in this group employed about 2.88% of the total employees in the region. The location quotients were less than 0.8 except for grass & ceramics (1.05 in 2007), primary metal manufacturing (1.33 in 2012) and mining (1.70 in 2012).The mining and computer & electronic

products manufacturing clusters clutters recorded substantial gain in employment, which was 136% and 105%, respectively.

Figure 2.1 presents some results for the North Delta Regional Planning & Development District. It shows that in 2002/07, mature industry clusters were forest and wood products (FW) and agribusiness, food processing & technology (AF). Important clusters in the growth category were the biomedical/biotechnical (BI), energy (EF) for both fossil and renewable energy and fabricated metal product manufacturing (FM).

Figure 2.1: The Relationship between Location Quotient and Employment Change for 2002/07 for the North Delta Regional Planning & Development District

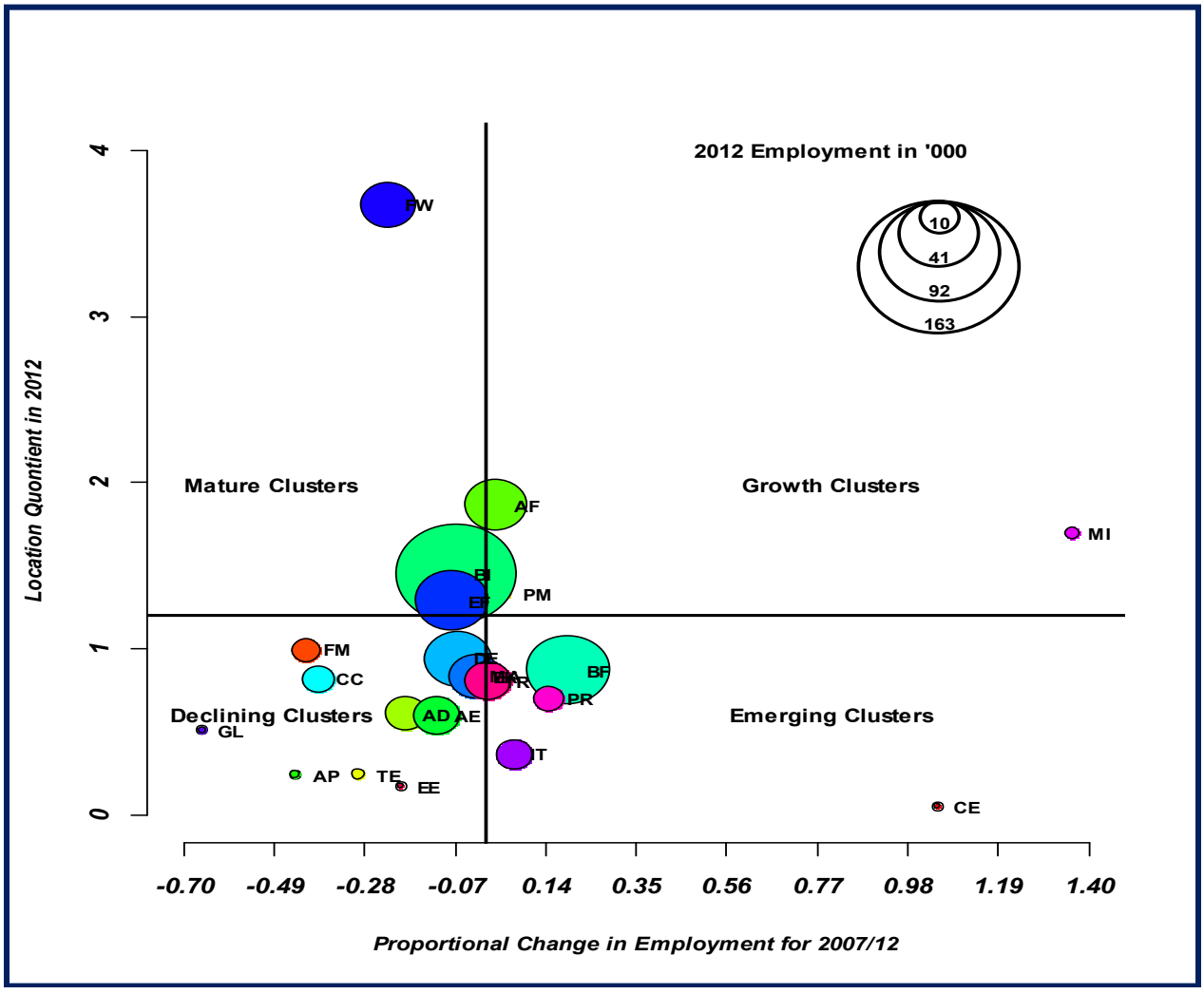


The chemical and chemical based products (CC) and the defense and security (DE) clusters had LQ close to 1.2 (Figure 2.1). The clusters experienced limited employment growth in 2002/07. Emerging industries in order of importance are education and knowledge creation (EK), advanced materials (AD), mining (MI), primary mental manufacturing (PM), and glass and

ceramics (GL). Industry clusters showing significant decline in concentration and employment are business and financial services (BF) and Transportation, and logistics (TR). Other clusters that declined in both concentration and employment include information technology and telecommunications (IT), machinery manufacturing (MA), arts, entertainment, recreation and visitor industries (AE), printing and publishing, transportation and Equipment manufacturing (TE) and apparel and textile (AP).

The relationship between estimated location quotient and change in employment for 2007/12 is as shown in Figure 2.2. Compared to the 2002/07 results, the Forest and wood products cluster remain to be in the mature cluster category. The biomedical/biotechnical (BI), energy (EF), and primary metal manufacturing (PM) are moving towards maturity. The mining cluster moved rapidly from emerging category with 49 employees in 2002 to growth category with 269 employees in 2012. The computer & electronics products manufacturing had an increase in employment and moved from a declining cluster in 2007 with 21 employees to an emerging cluster with 43 employees in 2012.

Figure 2.2: The Relationship between Location Quotient and Employment Change for 2007/12 for the North Delta Regional Planning & Development District



Notice that in Figure 2.2, the agribusiness, food processing and technology (AF) relatively moved from mature cluster towards growth cluster by increasing employment from 4,243 in 2007 to 4,355 in 2012, a 3% increase. The business & financial service (BF) cluster gained employment from 6,590 in 2007 to 7, 874 in 2012 (19% increase). This allowed the cluster to move from declining to emerging industry clusters. In addition, notice that due to relative gain in employment (Table 2), the printing & publishing (PR) and information technology & telecommunications (IT) clusters, moved from declining to emerging industry clusters. The industry clusters showing a rapid decrease in employment were fabricated metal product manufacturing that moved from mature to declining industry clusters and chemical and chemical based products that continued to shrink in both concentration and employment.

COMPARATIVE ADVANTAGE

Tables 3 show, respectively results on the shift-share analysis for the Capital Region Planning and Development District. In the Table, absolute change is change in employment for 2007/12. The data sorting in the table is by the regional share-effect. Notice that the national growth effect is negative indicating that the national job growth rate was negative for 2007/12. The number of job loss in each industry is relative to size. Four industry clusters that were highly and positively influenced by the national growth rates within clusters include biomedical/biotechnical that added 4, 964 jobs, defense and security (2,252 jobs), energy (1,941 jobs), and education and knowledge creation (1,909 jobs). The advanced materials manufacturing cluster, chemical & chemical based products cluster, and the energy cluster where highly and negatively impacted by the national growth rates. The three clusters lost 2,045, 1,802, and 1,499 jobs respectively.

Positive values in the region share column indicate that the cluster has regional comparative advantage. Industry clusters with comparative advantage that are in the first, and second tiers employer categories; included the advanced materials manufacturing cluster that added 1,493 jobs due to regional comparative advantage, the arts, entertainment, recreation & visitor industries cluster (917 jobs), education and knowledge creation cluster (597 jobs) and Chemical & Chemical based products clusters (575 jobs). Notice that while advanced materials manufacturing cluster and chemical & chemicals based products clusters where declining nationally, the two clusters had a comparative advantage in the region. The arts, entertainment, recreation & visitor industries cluster and the education and knowledge creation cluster were expanding both nationally and regionally. Other industry clusters showing national growth and regional comparative advantage were transportation & logistics cluster, the information technology & telecommunications cluster, and the mining cluster. The glass & ceramics cluster and electrical equipment, appliance & components manufacturing cluster has some potential in terms of regional comparative advantage.

Apart from the education and knowledge creation cluster that was growing nationally and had regional comparative advantage, the other four main employers (i.e., the biomedical/biotechnical (life sciences) cluster, energy cluster, business & financial services cluster, and the defense and security cluster) where expanding nationally but had no regional comparative advantage. For these clusters, employment growth is due to the employment

growth among these clusters at the national level. The expected change column shows expected additional jobs in the regional cluster if it followed the national trend exactly. Positive job numbers imply the cluster outperformed the national trend and vise versa. The total shift-share is the expected job gains after taking into account the cluster growth at the national level and regional competitiveness. If the total shift effect is positive, the industry mix effect is also positive, and the regional shift-effect is negative; then, the cluster's growth rate depends on the national trend (e.g., the last four clusters in Table 3). If the total shift effect is positive, the industry mix effect is negative, and the regional shift-effect is positive; then, the cluster's growth rate depends on the regional comparative advantage (e.g., electrical equipments, appliance and components manufacturing cluster).

Table 3: The 2012 Shift-Share for the Capital Region Planning and Development District

Cluster	2012 Shift-Share Effects					Absolute Change
	National	Industry	Region	Expected	Total	
Advanced Materials	-649	-2,045	1,493	-2,694	-552	-1,201
Entertainment & Recreation	-570	312	917	-258	1,229	659
Education & Knowledge Creation	-1,016	1,909	597	893	2,506	1,490
Chemicals & Chemical Products	-617	-1,802	575	-2,419	-1,227	-1,844
Fabricated Metal Product	-209	-518	507	-727	-11	-220
Printing & Publishing	-204	-486	471	-690	-15	-219
Primary Metal	-40	-427	416	-466	-10	-50
Apparel & Textiles	-59	-509	312	-569	-198	-257
Computer & Electronic Product	-15	-44	305	-59	261	246
Transportation & Logistics	-570	114	186	-456	300	-270
IT & Telecommunications	-263	141	118	-122	259	-4
Mining	-25	14	113	-12	126	101
Glass & Ceramics	-18	-89	47	-106	-41	-59
Electrical & Appliances	-5	-11	37	-16	26	21
Transportation Equipment	-52	-242	-119	-294	-361	-413
Food Processing & Technology	-269	119	-137	-150	-18	-287
Machinery	-46	-224	-152	-270	-376	-422
Forest & Wood Products	-250	-1,491	-469	-1,741	-1,960	-2,210
Business & Financial Services	-1,463	996	-601	-468	394	-1,069
Energy (Fossil & Renewable)	-1,790	1,941	-2,060	151	-119	-1,909
Biomedical/Biotechnical	-1,931	4,964	-3,235	3,033	1,729	-202
Defense & Security	-1,138	2,252	-4,317	1,114	-2,065	-3,203
Total	-11,200	4,874	-4,996	-6,326	-122	-122

Source: http://www.statsamerica.org and author's calculation

Shift-share analysis results for North Delta Regional Planning & Development District are as shown in Table 4. The results have similar interpretation as described above. The national growth effect was negative and has negative influence on job growth for all clusters. The industry clusters that were growing nationally and had high positive influence in the regions

include the biomedical/biotechnical industry clusters, the defense and security cluster, and the education and knowledge creation cluster. However, the three clusters had no comparative advantage in the regions.

Table 4 shows results on the shift-share analysis for the North Delta Regional Planning & Development District.

Cluster	Shift-Share Effects					Absolute Change
	National	Industry	Region	Expected	Total	
Business & Financial Services	-322	219	1,387	-103	1,606	1,284
Forest & Wood Products	-220	-1,309	517	-1,528	-791	-1,011
Printing & Publishing	-48	-113	307	-161	194	146
Food Processing & Technology	-207	92	228	-116	319	112
Mining	-6	3	158	-3	161	155
Machinery	-28	-135	147	-163	12	-16
IT & Telecommunications	-67	36	120	-31	156	89
Primary Metal	-9	-101	119	-110	18	9
Transportation & Logistics	-122	24	108	-98	132	10
Advanced Materials	-121	-380	45	-501	-335	-456
Computer & Electronic Products	-1	-3	26	-4	23	22
Apparel & Textiles	-11	-91	6	-102	-85	-96
Electrical & Appliance	-3	-7	-2	-10	-9	-12
Transportation Equipment	-17	-77	-5	-94	-82	-99
Glass & Ceramics	-13	-65	-98	-78	-163	-176
Education & Knowledge Creation	-162	304	-219	142	85	-77
Entertainment & Recreation	-134	73	-245	-60	-171	-305
Chemicals & Chemical Products	-96	-281	-386	-377	-667	-763
Fabricated Metal Product	-81	-201	-407	-282	-608	-689
Energy (Fossil & Renewable)	-316	342	-529	27	-186	-502
Defense & Security	-278	551	-647	272	-97	-375
Biomedical/Biotechnical	-856	2,200	-2,538	1,344	-338	-1,194
Total	-3,116	1,080	-1,908	-2,036	-828	-3,944

Source: http://www.statsamerica.org and author's calculation

One of the industry clusters with regional comparative advantage was business and financial services, which was also growing nationally. While the forest & wood products and printing and publishing clusters had comparative advantage, the clusters were downsizing nationally. Business and financial services cluster and the agribusiness, food processing & technology where growing nationally and had comparative advantage in the regions. Overall, the business & financial services cluster has positive net effects in terms of total shift share.

The results have implications on the target industries for the North Delta Regional Planning & Development District. The first target industry is health that care grew by 4% in 2002/07 but shrunk by 7% in 207/12. Employment growth in this cluster was due to national trend rather than regional comparative advantage. The second target industry is the retail trade in the business & financial services clusters. After declining by 12% in 2002/07, the cluster's employment increased by 19% in 2007. Likewise, the cluster was growing nationally but has no regional comparative advantage. The third target industry is the education service industry in the education & knowledge creation cluster. While this cluster was growing nationally, it has no regional comparative advantage. Employment in this cluster increased by 40% in 2002/07 but decreased by 2% in 2007/12. The fourth and fifth target industries are manufacturing and tourism. While employment in the primary metal manufacturing has been growing steadily from 190 employees in 2002 to 202 employees in 2012, employment in the tourism industry has declined from 2,740 to 2,428 in the same period. These results indicate that national growth within these industry clusters may not be sufficient to support targeted industries. Targeted investment and public industry policies may be need for further growth and development.

SUMMARY AND IMPLICATION FOR POLICY

Louisiana offers several programs, incentives and initiatives to stimulate regional economic development. The Capital Region Planning and Development District has identified chemicals and new energy production, fabricated structural metals, software design (enterprise, industrial, and gaming applications), technical research & consulting, advanced shared services, agribusiness, food processing & technology, health care, film production & entertainment services, and emerging fuel sectors as target industries. The North Delta Regional Planning & Development District had identified heath care, retail trade, education services, manufacturing, and tourism as target industries for economic development and employment generation. The objectives of this study were identifying and mapping the existing clusters along with targeted industries.

The study uses location quotient to compares the concentration of employment in a local industry cluster to the concentration of employment in the same cluster regionally or nationally. The shift-share ratio was for examining the competitiveness of the region's industry clusters by decomposing job growth into three components; that is, the national share, the industry mix and the regional shift. For the Capital Region Planning and Development District, industry clusters showing stability and growth (at the national level) are the chemicals, new energy production and emerging fuel sectors that are contained in the chemicals and chemical products and Energy clusters. The computer and electronic product manufacturing and information technology and telecommunications that support software design industries were still weak to support a rapid growth of these targeted industries. The agribusiness, food processing and technology industry cluster that supports food processing and technology shows insignificant growth in both concentration and employment. All major employers had no regional comparative advantage.

For the North Delta Regional Planning & Development District, apart from the education and knowledge creation cluster that was growing nationally and had comparative advantage in the region, the other four main employers (i.e., the biomedical/biotechnical (life sciences) cluster, energy cluster, business & financial services cluster, and the defense and security cluster) where expanding nationally but had no regional comparative advantage. One of the industry clusters with regional comparative advantage was business and financial services, which was also growing nationally. Almost all major and important industry clusters were fueled by national growth rather that regional comparative advantage.

In both regions, emerging industries are relatively small and terms of concentration and employment. Compared to 2002/07 and 2007/12, most of the non-traded clusters are moving towards declining clusters. These results may be an indication of structural shift from an economy dominated by these clusters to one dominated by growth and emerging but few industry clusters. The policy and education systems will need to develop the capacity to accommodate anticipated labor mobility and to provide a sustainable labor needs in the high growth and emerging industries. Further studying the declining industry clusters in both districts would map the extent of inter-sectoral labor mobility, skill differentials in mobility, the impact of the type of training on mobility and changes in mobility patterns. There is also a need to study the major employers to identify value-adding activities to create spoke industries that may buy from or sell to these mature and growing clusters. It also important to note that industry cluster formation is not a dogma but a dynamic process shaped by regional circumstances and characteristics of mature, growth and emerging industries. This means that an identification of clusters and knowledge regarding linkages is a dynamic process and very important in implementing industry cluster-based economic development strategies.

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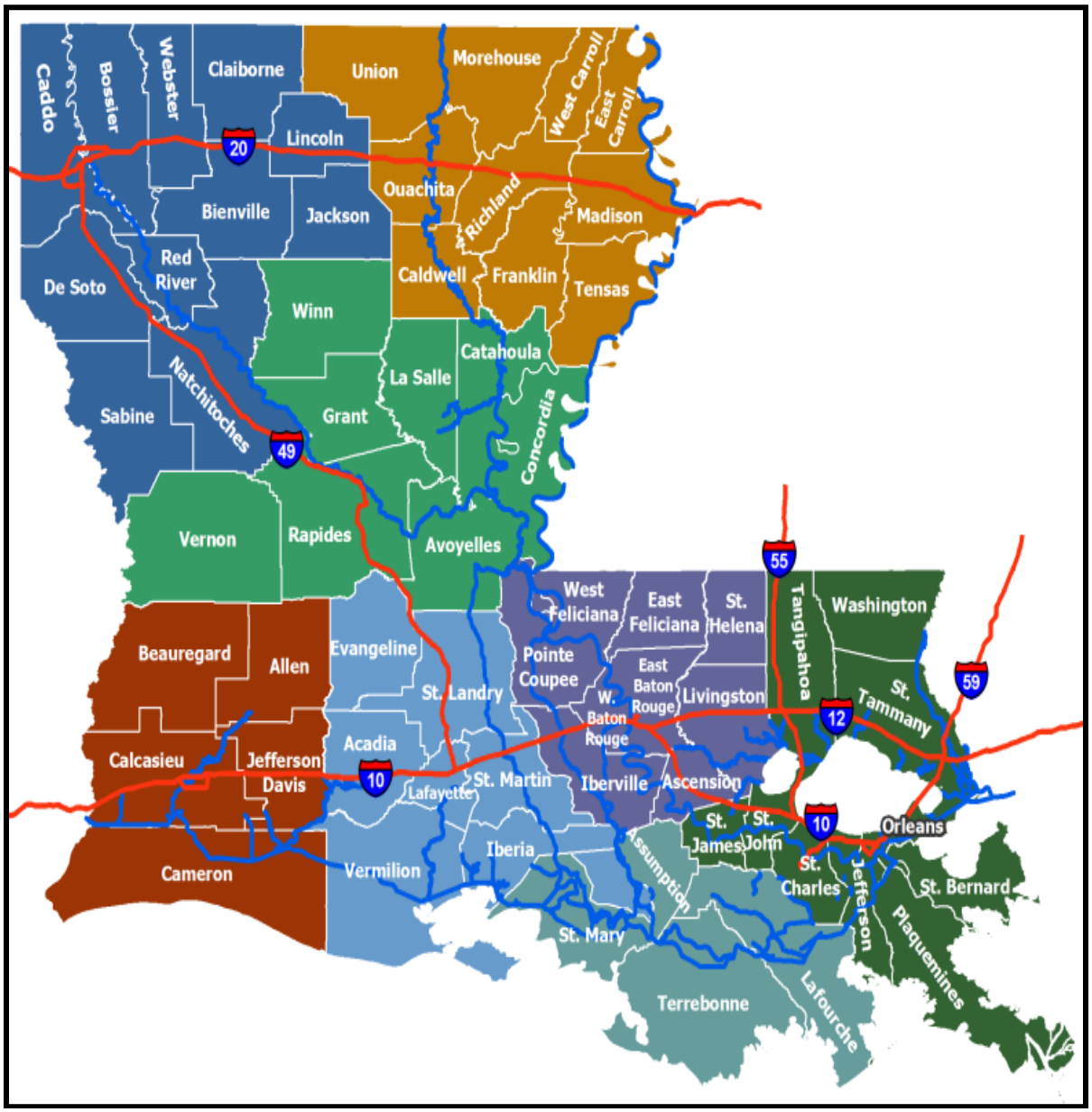
Appendix 1: Key for Figures 1 and 2

Complete Key to the Abbreviations in the Graphs

Industry	Abreviation
Advanced Materials	AD
Arts, Entertainment, Recreation & Vistor Industries	AE
Agribusiness, Food Processing & Technology	AF
Apparel & Textiles	AP
Business & Financial Services	BF
Biomedical/Biotechnical (Life Sciences)	BI
Chemicals & Chemical Based Products	CC
Computer & Electronic Product Mfg	CE
Defense & Security	DE
Electrical Equipment, Appliance & Component Mfg	EE
Energy (Fossil & Renewable)	EF
Education & Knowledge Creation	EK
Fabricated Metal Product Mfg	FM
Forest & Wood Products	FW
Glass & Ceramics	GL
Information Technology & Telecommunications	IT
Machinery Mfg	MA
Mining	MI
Primary Metal Mfg	PM
Printing & Publishing	PR
Transportation Equipment Mfg	TE
Transportation & Logistics	TR

Appendix 2: Louisiana Regional Planning Districts



Source: http://wwwprd.doa.louisiana.gov/census/plandist.htm