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***Creating Occupation Projections Using  
Input-Output Analysis***

by

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### **Abstract**

Building upon the methodology put forth by Carlson and Theodore (1998), we construct a methodology using input-output analysis to generate occupation projections for a local community. After describing the methodology, we present two case studies to demonstrate how the methodology can be used by local economic development officials and labor market intermediaries. The first case study is an evaluation of the Chattanooga Regional Growth Initiative, an economic development strategy being implemented in Chattanooga, TN. The second case study provides guidance in choosing between two potential manufacturers for an industrial site based on the manufacturers' impact on the poor. We find that both case studies generate accessible, economically empowering opportunities for the poor and unskilled labor force, and that labor market intermediaries should consider serving this labor force through job readiness training.

In their article presenting a method to identify local job opportunities, Nikolas Theodore and Virginia Carlson (1998) emphasize the need to integrate services provided by labor market intermediaries and economic developers. Specifically, they suggest that labor market intermediaries need to rely more heavily on timely economic development methodologies for estimating local employment opportunities than traditional methods based upon long-term industrial relationships between intermediaries and specific firms in the community. To this end, they lay out a procedure for intermediaries to utilize which estimates the types of occupations employed and the number of jobs available at community businesses. Their methodology utilizes readily accessible, local data to generate current occupation by industry employment estimates.

Theodore and Carlson's methodology is powerful because it allows for labor intermediaries to assess the *current* labor market in order to develop training and employment opportunities. However, their methodology cannot adequately forecast occupational employment, especially when structural changes occur in the local economy. Economic structural change refers to alterations in the basic composition of economic activities in a community; examples are a disproportionate expansion of an existing firm or industry, the location of a new firm to the community, or the relocation of a local firm outside of the local community. When structural changes occur, there are often "ripple" effects to other sectors of the local economy because of the linkages that exist between firms. Economic developers will recognize this as the multiplier effect.

Clearly, local government, economic development organizations and labor intermediaries would be expected to anticipate or react to structural changes and their impact on the local labor market. Furthermore, local government and economic development organizations must make choices between competing economic development opportunities, and the impact of each option on the local labor market should be one consideration in the decision. Labor intermediaries must equip and enable the local labor force to meet the needs of the new labor market situation, and so early information about structural changes will facilitate their planning. How can local economic development decision-makers choose which economic development option is best for their locale? How do labor intermediaries know what types of occupations will be in demand so they can train and direct people accordingly? By incorporating input-output analysis--an economic development tool that can estimate changes in employment resulting from structural changes in the local economy--into the projection methodology, one can arrive at reasonable occupation projections resulting from these 'shocks' to the local economy.

We build upon Theodore and Carlson's methodology to create occupational employment projections of structural changes in the local economy. Specifically, we use input-output analysis to estimate new employment resulting from two different case studies: 1) the implementation of a specific economic development strategy, and 2) the choice between attracting a new automobile or computer manufacturer into the local economy. By translating industrial employment projections into occupational projections, we can evaluate the types of jobs of various skill levels created from the employment growth. Of particular concern is creating jobs that are accessible to the poor and unemployed, as economic development practitioners are increasingly being held accountable to ensure that economic development affects every class of society. In addition, local economic development practitioners must balance the demand for specific occupations created from their development strategies/plans and the ability of the local labor market and its intermediaries to meet that demand. This, in turn, has

implications for the intermediaries themselves in terms of the types of training and education programs they offer.

The remainder of the paper describes how our occupation projections were calculated using input-output analysis. We then present the two case studies to illustrate how the methodology can be used. In each of the two case studies, we will answer the following questions:

1. How accessible will the jobs created be to the unskilled and/or poor?
2. What will be the impact on occupations of all skill levels in Chattanooga? i.e., which occupations will experience an increase in demand in each of the scenarios?
3. What are the implications for vocational training, post-secondary educational institutions and other training intermediaries?

## **Projecting Occupational Employment**

### *Estimating Industrial Employment*

The starting point for any occupational projection project is the calculation of expected employment growth for the region. Input-output analysis is ideal for such a calculation. Using the local structure of the economy and the interlinkages between each sector, input-output analysis is able to estimate the ripple effects throughout the economy of any particular shock. As a result, it is superior to simplistic projections of employment based upon previous employment trends, which assume uniform growth across sectors.

Input-output analysis estimates three employment impacts: direct, indirect and induced. Direct impacts refer to the jobs initially created by a new or expanding firm when it hires employees to staff its own operations. Of course, the new or expanding firm necessarily needs inputs to increase production, many of which may come from local producers of those inputs. The indirect impact refers to the expansion in employment in these local suppliers as they increase their production to meet the increased demand for their output. Induced impacts result from the increased consumption of households affected by the new jobs. In other words, induced impacts reflect the additional consumption of those who are newly employed as a result of the direct and indirect impacts and who will spend their paychecks, at least in part, locally.

One of the strengths of input-output analysis is that it allows for *ceteris paribus* (all else equal) analysis, enabling the researcher to examine the impact of particular policies in isolation of other events and policies. However, a word of caution is in order, because in a dynamic world not all else is likely to remain constant. Other events or policies could alter the actual impact of the policy in question.

There are two major drawbacks with using input-output analysis to generate employment projections. The first is that one cannot predict how long it will take the multiplier effect to be fully realized in the local economy. Typically, economic developers would say that it takes a *reasonable* amount of time – not more than 10 years--but it is hard to be precise about how long it will take the economy to fully adjust to the initial event. Second, while input-output analysis generates specific employment and output figures, these figures are based on data which is imperfect; hence, the figures should be viewed as estimates of impact magnitude and not as precise measures.

For this paper, we use IMPLAN software to perform the input-output analysis. IMPLAN was originally created for the U.S. Department of Agriculture Forest Service as a planning tool for its Land Management Planning Unit. IMPLAN has been widely used by the academic and economic development communities to estimate the impact of structural changes to local

economies (see Bairak and Hughes, 1996; Bergstrom, 1990; Crihfield and Campbell, 1991; Hughes and Litz, 1996). The software utilizes local employment and output data available at the county or zip code level and national production functions to simulate a local economy. The database is built from Bureau of Labor Statistics' Covered Wages and Employment Survey (ES-202 data) and output data from the Bureau of Economic Analysis. By inputting an employment or output change, the software is able to estimate the impact a structural change will have in the local economy for 528 industrial sectors (including government and non-profit sectors).<sup>1</sup> IMPLAN generates estimates of employment, output, labor income and taxes generated from the direct, indirect, and induced effects of the economic shock. IMPLAN also provides a crosswalk to translate the industrial employment impacts into occupational employment estimates for 819 different occupations. This breadth of industrial and occupational data in IMPLAN allows us to overcome the problem of having to aggregate data on the local level due to disclosure and availability issues (see Theodore and Carlson, 1998; Kurre, Louie and Weller, 1993). Our occupation projections are very specific and thus very useful to labor market intermediaries and local officials.

To generate employment projections in IMPLAN, one simply needs to provide an initial output or employment shock value for a given set of industries. For the first case study--the impact of Chattanooga's Regional Growth Initiative--we estimated output growth in each of four industrial clusters by calculating the compounded annual growth rate in employment for each of the clusters between 1988 and 1997, the latter being the most recent year for which data were available. Because there have not been significant structural changes in the Chattanooga economy since 1997, the results are nearly identical to what would have been obtained if more recent data had been available. Assuming that the local economic development initiative will enhance the productivity of the clusters (i.e., they will grow faster than they had over the previous decade), we multiplied the annualized growth rate by 150% to arrive at the estimated annual growth rate for this study. This growth rate was then multiplied by 1997 output figures for each industry to create the output shocks that would generate our employment projections. Table 1 contains the four clusters, their annual growth rate and their corresponding projected increase in output, and the direct employment impact to the economy. For the second case study--the impacts of attracting either an automobile or computer plant to an industrial site in Chattanooga-- we simply used information from the local paper describing the sizes of these two plants.

Table 1: Estimated Growth Rates and 'Shock' Values

Cluster Name <sup>#</sup>	1997 Output (in millions)	Estimated Growth Rate	Projected Increase in Output (in millions of dollars)	Direct Employment Shock (nos. of jobs)
Medical Devices and Health Services	\$2,449.44	13.5%	\$330.67	3,055
Logistics and Transportation	\$1,391.02	7.9%	\$109.89	961
Hospitality and Tourism	\$522.41	6.0%	\$31.34	454
Confectionery and Baked Goods	\$1,127.78	3.2%	\$35.53	157

<sup>#</sup> The cluster definitions were provided by Michael E. Porter, Harvard Business School, as part of his involvement in creating the Chattanooga Regional Growth Initiative. See Appendix 2 for the specific definitions of these clusters. Cluster definitions include only those industries that export a majority of their output outside of the region.

### *Translating Industrial Employment to Occupational Employment*

The employment projections received from IMPLAN must be converted via a staffing patterns matrix into occupation projections. As Theodore and Carlson (1998) describe, a staffing patterns matrix contains information on occupational employment for each industry. Any given cell of the matrix contains the proportion of total industrial employment in that occupation. The Minnesota IMPLAN Group, Inc., developers of the IMPLAN software, have compiled a national staffing patterns matrix which redistributes the US Bureau of Labor Statistics' Occupational Employment Statistics (OES) and Employment Projections (EP) 1997 data from 3-digit Standard Industrial Classifications to the IMPLAN sectors. Due to its compatibility to our employment estimates, IMPLAN's national staffing patterns matrix was used.<sup>2</sup>

The IMPLAN total employment projections were then multiplied by the national staffing patterns matrix to generate occupation by industry employment estimates.<sup>3</sup> The values in the matrix were summed by occupation to yield the total number of jobs created in each occupation for each cluster impact. In addition, average wages for each occupation, weighted by industrial employment, were created by multiplying the estimated occupational employment by industry matrix by the occupational wage by industry matrix, summing across industries, and dividing the sum totals by the total number of estimated jobs in each occupation. Average wages weighted by industrial employment for each occupational job zone were also computed. Job zones are categories of occupations that require similar levels of education, training and experience and are discussed more fully in the next section.

### *Classifying Occupational Employment*

The O\*NET Career Exploration Program of the National O\*NET Consortium stratified occupations into five categories by their Specific Vocational Preparation (SVP) value; these "job zone" values were then associated with the 819 occupations in our data set.<sup>4</sup> The job zone categories provide the database user with an idea of how much training, education and experience is needed to enter any given occupation. The job zones are assigned a number between 1 and 5, where a higher number corresponds to higher experience, education, and/or training requirements for occupations in that job zone. For example, Job Zone 1 contains all the occupations for which no previous experience, high school education or training is required. Job Zone 5, on the other hand, contains those occupations that require extensive skills and education, with a bachelor's degree being the minimum education requirement. By sorting the final occupational projections by job zone, we were able to aggregate the distribution of jobs across the job zones and compute the average wage for each job zone, in addition to identifying the estimated number of jobs and average wages in each occupation within each job zone. Table 2 presents descriptions of the five job zones.

### **Case Study 1: Chattanooga Regional Growth Initiative**

The Chattanooga Regional Growth Initiative (CRGI) is the economic development program for the Chattanooga, TN region. The program exists to increase wage and employment opportunities by enhancing industrial productivity through facilitated discussions and activities among related and supporting industries. The foundational principle guiding the CRGI is that competition among clusters of firms that produce complementary or similar goods will cause all firms to innovate and create new, better, and more highly valued products. Michael E. Porter describes this effect of competition as a region's competitive advantage, and several have written

about using clusters as an economic development strategy (see Porter, 2000; Waits, 2000; Hill and Brennan, 2000; Austrian, 2000).

Table 2: Job Zone Descriptions

Job Zone	Description	SVP Range	Examples
1	<ul style="list-style-type: none"> <li>No previous work-related skill, knowledge, or experience is needed for these occupations.</li> <li>One may need a high school diploma or GED.</li> <li>Training will last as few as a couple of days to a couple of months.</li> </ul>	< 4.0	<ul style="list-style-type: none"> <li>Bus drivers</li> <li>General office clerks</li> <li>Home health aides</li> <li>Waiters/Waitresses</li> </ul>
2	<ul style="list-style-type: none"> <li>Some previous work-related skill, knowledge, or experience may be helpful in these occupations, but usually is not needed.</li> <li>A high school diploma or GED is required, and in some cases additional vocational training or course work may be necessary.</li> <li>Training will last between a few months and one year.</li> </ul>	4.0 – 6.0	<ul style="list-style-type: none"> <li>Drywall installers</li> <li>Flight attendants</li> <li>Salespersons</li> <li>Bank tellers</li> </ul>
3	<ul style="list-style-type: none"> <li>Previous work-related skill, knowledge, or experience is required for these occupations.</li> <li>Most occupations will require vocational training, on-the-job experience, and/or an associate's degree. Some may require a bachelor's degree.</li> <li>Training requires one to two years involving on-the-job/informal training.</li> </ul>	6.0 – 7.0	<ul style="list-style-type: none"> <li>Dental assistants</li> <li>Fish and game wardens</li> <li>Personnel recruiters</li> <li>Recreation workers</li> </ul>
4	<ul style="list-style-type: none"> <li>Minimum of two to four of work-related skill, knowledge or experience is required.</li> <li>Most occupations will require a four-year bachelor's degree.</li> <li>Training involves several years of on-the-job and vocational training.</li> </ul>	7.0 – 8.0	<ul style="list-style-type: none"> <li>Accountants</li> <li>Chefs</li> <li>Historians</li> <li>Pharmacists</li> </ul>
5	<ul style="list-style-type: none"> <li>Extensive skill, knowledge, and experience are needed for these occupations. Many require more than five years of experience.</li> <li>A bachelor's degree is the minimum requirement for these occupations. Many require a graduate degree.</li> <li>It is assumed that the individual is already trained for the position.</li> </ul>	> 8.0	<ul style="list-style-type: none"> <li>Lawyers</li> <li>Doctors</li> <li>Scientists</li> </ul>

The Chattanooga region comprises four counties in Tennessee and four counties in Georgia. The Tennessee counties are Bradley, Hamilton, Marion, and Rhea. The Georgia counties are Catoosa, Dade, Walker, and Whitfield. Michael E. Porter was retained to assist with the development of the CRGI, and specifically he brought the data and expertise needed to identify the first four clusters in the region for the initiative. The geographic focus for this paper was limited to Hamilton County because we wanted to examine the impact of the CRGI in creating jobs accessible to the poor in terms of requirements and proximity. As Hamilton County is the urban core of the region, it has the highest percentage of poor individuals. The four clusters identified by Porter--Confectionery and Baked Goods, Hospitality and Tourism, Logistics and Transportation, Medical Devices and Health Services--are the focus of our occupational projections.

As previously mentioned in Table 1, we assumed that CRGI would create more productive and prosperous clusters – as Porter’s competitive advantage theory predicts. Consequently, these clusters should grow more quickly than previously, and they should lead the region’s growth in economic activity. As discussed earlier, the direct effects of these clusters’ growth (see Table 1) will ripple throughout the rest of the economy via the indirect and induced effects. Table 3 shows the total employment impact resulting from one year of growth in these four clusters, as estimated by IMPLAN. Because IMPLAN aggregates some SIC codes to form its industrial sectors, our clusters are not exactly congruent to Porter’s cluster definitions. For example, Porter defines the Medical Devices and Health Services cluster to include SIC 5047: Medical and Hospital Equipment. However, IMPLAN aggregates all Wholesale Trade SIC codes into one sector, Sector 447. Because of the distortion created by this aggregation in IMPLAN, we chose to exclude Wholesale Trade from our Medical Devices and Health Services cluster.<sup>5</sup>

Table 3: Total Employment Impacts

Cluster Name	Assumed Estimated Growth Rate from Table 1	Total Employment Creation (nos. of jobs)	Employment Creation from Direct Effects	Employment Creation from Indirect and Induced Effects
Medical Devices and Health Services	13.5%	6,219	3,055	3,164
Logistics and Transportation	7.9%	2,232	961	1,271
Hospitality and Tourism	6.0%	779	454	325
Confectionery and Baked Goods	3.15%	470	157	313

If Chattanooga leaders were only concerned with job creation, Medical Devices and Health Services would be the clear choice of clusters on which to focus their economic development efforts, and Logistics and Transportation would be a great second choice because of the number of jobs these clusters will create. Assuming the Medical Devices and Health Services cluster grows 13.5% annually, the estimated, total job creation resulting from one year of such growth will be 6,219 jobs. Note that over half of this growth comes from the indirect and induced effects. Apparently, this cluster has strong linkages to other sectors in the economy. Likewise, if the Logistics and Transportation cluster increases output by 7.9% annually, a total of 2,232 new jobs will result from one year of such growth. Again, over half of these jobs are due to induced and indirect effects. Similarly strong linkages are observed in the Confectionery and Baked Goods cluster as well. The Chattanooga Area Chamber of Commerce, administrator of

the Initiative, has chosen to pursue all of the clusters rather than select just one, so one would expect each of these clusters to grow faster than in previous years.

As mentioned previously, in estimating the impact of an event, IMPLAN assumes that no other structural changes occur. Because of this assumption, the IMPLAN results in Table 3 cannot simply be summed to arrive at a total impact if all scenarios occur simultaneously. For example, in estimating the impacts of the Medical Devices and Health Services cluster, we assume the other three clusters are not growing. Hence, the figures in Table 3 are all the isolated impacts that would result if each cluster grew while the others did not. This is clearly a problem when trying to evaluate the overall impact of the Chattanooga Regional Growth Initiative, since there may be synergies that emerge when all clusters grow together. The good news, however, is that the sum of the employment estimates in Table 3 will underestimate the actual employment generated from all four clusters growing simultaneously.

The employment projections in Table 3 were then translated into occupation projections by multiplying the total employment impact by industry from IMPLAN by the national staffing patterns matrix to yield occupational employment projections and estimated average wages. These occupation projections were then stratified by their job zone values. Table 4 presents the stratified occupation results for each cluster.

Table 4: Stratified Occupation Projections by Cluster

Cluster	Job Zone	No. of Jobs (% of total jobs created)	Hourly Wage Range	Average Hourly Wage
Medical Devices and Health Services	Total	6,219	\$5.86 – \$51.96	\$14.63
	1	1,650 (27%)	\$5.86 – \$19.40	\$9.78
	2	1,382 (22%)	\$6.10 – \$26.54	\$12.24
	3	1,451 (23%)	\$6.70 – \$27.80	\$14.12
	4	1,325 (21%)	\$8.01 – \$40.90	\$18.82
	5	409 (7%)	\$10.19 – \$51.96	\$24.15
Logistics and Transportation	Total	2,232	\$5.87 – \$50.75	\$14.65
	1	1,049 (47%)	\$5.87 – \$19.40	\$9.91
	2	464 (21%)	\$6.10 – \$26.60	\$12.26
	3	356 (16%)	\$6.72 – \$28.16	\$14.09
	4	259 (12%)	\$8.27 – \$40.86	\$18.76
	5	103 (5%)	\$10.19 – \$50.75	\$24.07
Hospitality and Tourism	Total	779	\$6.11 – \$50.37	\$14.67
	1	309 (40%)	\$6.11 – \$18.21	\$9.69
	2	170 (22%)	\$6.36 – \$26.69	\$12.29
	3	145 (19%)	\$7.31 – \$27.79	\$14.13
	4	112 (14%)	\$8.32 – \$40.86	\$18.84
	5	42 (5%)	\$10.19 – \$50.37	\$23.97
Confectionery and Baked Goods	Total	470	\$5.88 – \$50.71	\$14.73
	1	204 (43%)	\$5.88 – \$18.25	\$9.92
	2	99 (21%)	\$6.10 – \$26.70	\$12.34
	3	92 (20%)	\$6.74 – \$27.94	\$14.21
	4	55 (12%)	\$8.23 – \$40.86	\$18.73
	5	20 (4%)	\$10.19 – \$50.71	\$24.09

From Table 4, it is evident that employment opportunities accessible to unskilled workers are abundant. In three of the four clusters, job creation in Job Zone 1, the unskilled category, accounts for over forty percent of all jobs to be created. Even in Medical Devices and Health Services, Job Zone 1 occupations comprise one-quarter of all jobs to be created. Furthermore, Job Zone 2 occupations, which require a high school education but no experience, account for roughly a fifth of all jobs created in each cluster. From an equity perspective, the employment opportunities created by growth in these four clusters heavily favor occupations that require no experience, little education and no training. In all but Medical Devices and Health Services, those occupations requiring more than a high school education and/or previous experience (Job Zone 3 or higher) represent only about one-third of the total jobs created by the cluster's growth. These occupations comprise about half of the jobs created in Medical Devices and Health Services. This suggests that ample opportunities are created for existing unskilled labor, but it also suggests that some opportunities will exist for more educated individuals.<sup>6</sup>

Even though the number of new jobs created by the four estimated scenarios tend to be skewed toward less-skilled workers, the wages paid in these clusters are relatively high. On average, all clusters pay over 2.5 times the minimum wage and, when hourly wages are annualized,<sup>7</sup> pay is well above the poverty line with average annual pay ranging from \$29,850 to \$30,050.<sup>8,9</sup>

Additionally, the data in Table 4 are at least suggestive<sup>10</sup> of the types of vocational training/educational programs that workforce development organizations and welfare programs should target their training components toward. Given the high number of new jobs which require low levels of education and no formal training (Job Zones 1 and 2), labor market intermediaries should consider job readiness programs that focus on "soft skills" training such as writing a resume, interviewing for a job, communicating effectively, being timely, exhibiting attitudes of respect, having a good work ethic, etc. This is also good news for local Temporary Assistance for Needy Families programs because welfare recipients must seek employment first before receiving training and/or education vouchers. The CRGI will generate many job opportunities for this population that do not require technical training or higher education.

For occupations requiring more specific skills training, the labor market intermediary would need to know the exact occupations for which to target their programs. Table 5 presents the list of occupations, by job zone, in which 50 or more jobs would be created due to growth in the Medical Devices and Health Services cluster. (A complete list of all jobs created by each cluster for all 819 occupations is available from the authors upon request.) For example, 195 general office clerk positions will be created by this scenario with each paying on average \$9.58 per hour. Likewise, 162 top executive/general manager positions will be created each paying roughly \$64,500 annually (\$31.62 per hour times 2,040 hours per year).

Local technical or community colleges may want to focus on providing training for the rapidly growing occupations in Job Zone 3, which require some post-secondary training. Specifically, using Table 5 we see that local technical schools may want to consider providing training in licensed practical nursing, phlebotomy, or medical records management. In fact, Chattanooga State Technical Community College offers several associate degree and certificate programs in Applied Health to address these skill needs. Furthermore, organizational management skills are common among Job Zone 4 and 5 occupations, which suggests that local colleges and universities may want to increase the resources they allocate to providing courses in these areas.

To identify further the specific characteristics of an occupation, one would consult the O\*NET 3.0 database, which is available on-line at [www.onetcenter.org](http://www.onetcenter.org). This exhaustive database provides the intermediary with information on the skills, minimum education level and/or training, and experience requirements as well as examples of tasks and other characteristics associated with the occupation. For example, the three most common tasks of general office clerks are documenting/recording information, processing information, and communicating with individuals outside the organization. The most important skills to an office clerk include clerical skills, customer and personal service and mastery of the English language. A training program targeting this particular occupation would focus their training on developing competency in these skills and tasks.

Table 5: Occupation Projections from the Medical Devices and Health Services

Occupation Title	No. of Jobs	Average Hourly Wage
<b>Job Zone 1</b>		
General Office Clerks	195	\$9.58
Receptionists and Information Clerks	150	\$9.26
Cashiers	93	\$6.98
Home Health Aides	90	\$8.65
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	70	\$8.01
Maids and Housekeeping Cleaners	62	\$7.35
Waiters and Waitresses	54	\$5.86
All Other Clerical and Administrative Support Workers	54	\$11.49
<b>Job Zone 2</b>		
Secretaries, Except Legal and Medical	148	\$11.81
Salespersons, Retail	123	\$8.34
Bookkeeping, Accounting, and Auditing Clerks	98	\$11.48
Nursing Aides, Orderlies, and Attendants	83	\$8.29
Insurance Policy Processing Clerks	72	\$11.92
Insurance Claims Clerks	70	\$12.15
Adjustment Clerks	52	\$11.67
<b>Job Zone 3</b>		
First-Line Supervisors and Managers/Supervisors - Clerical and Administrative Support Workers	130	\$16.45
Sales Agents and Placers, Insurance	106	\$19.25
Insurance adjusters, Examiners, and Investigators	93	\$19.24
Licensed Practical Nurses	84	\$12.81
First-Line Supervisors and Managers/Supervisors - Sales and Related Workers	70	\$17.72
Medical Assistants	62	\$10.06
Dental Assistants	60	\$10.86
All Other Health Professionals, Paraprofessionals, and Technicians	53	\$14.36
Systems Analysts, Electronic Data Processing	50	\$24.16
<b>Job Zone 4</b>		
Registered Nurses	310	\$19.94
All Other Managers and Administrators	66	\$26.27
Accountants and Auditors	60	\$19.35
All Other Management Support Workers	52	\$18.72
<b>Job Zone 5</b>		
General Managers and Top Executives	162	\$31.62
Physicians and Surgeons	103	\$51.96

Overall, it appears that the Chattanooga Regional Growth Initiative will succeed in creating job opportunities that are accessible to all residents of the community. Most of the jobs created require little experience, education/training, or skill (i.e., they are Job Zone 1 and 2 occupations) and yet are at a livable wage above the poverty line. In addition, ample jobs will be created for graduates of the various higher education institutions in the community. The overall result being that the average wage of the jobs created is more than a dollar per hour higher than the regional average wage of \$13.48 per hour.<sup>11</sup> Thus, the CRGI has the potential to create not just jobs but jobs that offer families economic independence and stability, and the opportunity to raise the standard of living for the region.

The impact of the Chattanooga Regional Growth Initiative on the labor market will have profound implications for intermediaries. The most obvious implication is that over half of the jobs created through this initiative do not require more than a high school level of education with no formal vocational training. Thus, the greatest need for training is for job readiness training and not technical, job skill training. In addition, post-secondary educational and vocational training institutions should probably orient their programs toward the Medical Devices and Health Services and/or Logistics and Transportation clusters simply because of the volume of jobs that would be created by these scenarios. Lastly, the type of information provided in Table 5 provides a list of occupations for which significant demands will exist, giving guidance to job skills trainers as to those skills on which their programs should focus.

### **Case Study 2: Locating a New Firm in Chattanooga, TN**

The City of Chattanooga and Hamilton County governments recently purchased 940 acres of the Volunteer Army Ammunitions Plant (VAAP) to develop for industrial and commercial use. Officials have stated that they would like an automotive or computer manufacturer that would employ several hundred people to occupy at least part of the VAAP site (Walton, 2000). Realizing this economic development opportunity for the Chattanooga region, we applied our methodology to evaluate which plant would generate the larger impact on the poor, and the implications of locating each plant for labor market intermediaries.

Table 6: Employment Impacts from an Automobile or Computer Plant in VAAP

Type of Impact	No. of Jobs	
	Automobile Plant	Computer Plant
Total	1,963	1,070
Direct	350	350
Indirect and Induced	1,613	720

Consistent with the desires of government officials, we assume that each plant would directly employ 350 workers. Table 6 presents IMPLAN estimates of the total employment impact that each of these plants would have in Hamilton County, TN. One can see from the indirect and induced effects that an automobile manufacturing plant would complement the local economy very well as it creates nearly five jobs throughout the economy for every one job at the new plant. The computer plant would only generate an additional two jobs for every job at the plant. While this demonstrates strong linkages to the local economy, the multiplier effect of the automobile plant is bigger.

Table 7: Jobs Created by Each Manufacturer and Their Wages by Job Zone

Plant	Job Zone	No. of Jobs (% of total jobs created)	Hourly Wage Range	Average Hourly Wage
Automobile	Total	1,963	\$5.87 – \$50.70	\$14.82
	1	661 (34%)	\$5.87 – \$19.40	\$10.08
	2	562 (29%)	\$6.10 – \$26.71	\$12.52
	3	360 (18%)	\$6.73 – \$27.28	\$14.29
	4	285 (15%)	\$8.12 – \$40.86	\$18.91
	5	95 (5%)	\$10.19 – \$50.70	\$24.12
Computer	Total	1,070	\$5.87 – \$50.78	\$14.71
	1	284 (27%)	\$5.87 – \$19.40	\$9.75
	2	234 (22%)	\$6.10 – \$26.74	\$12.24
	3	222 (21%)	\$6.73 – \$27.79	\$14.19
	4	244 (23%)	\$8.14 – \$40.86	\$19.02
	5	86 (8%)	\$10.19 – \$50.78	\$24.36

Table 7 classifies the employment impact from each option into job zones. Both manufacturing plants generate ample opportunities for unskilled workers, but the automobile plant has a far greater impact in this regard, generating 705 more jobs in Zones 1 and 2 than the computer plant of the same size.

Table 7 also presents the wage range and average wages by job zone for the jobs created under each scenario. The wages for both plants exceed the minimum wages and the poverty line, suggesting that either firm at VAAP could bring economic empowerment to the poor in Chattanooga. However, the automobile plant generates jobs with a higher overall average wage with higher wages for Job Zones 1, 2, and 3 than those from the computer plant.

The automobile plant appears to have the higher impact on the poor, since it generates a larger number of jobs accessible to unskilled and low-skill workers and pays them higher wages. Government officials are faced with a clear choice. The automobile plant is a far better option than the computer plant in generating economic opportunities for the poor.

Table 8 lists the specific occupations in which 20 or more jobs would be created by the location of an automobile manufacturer to the VAAP site (a complete list of occupations created by either the automobile or computer manufacturers is available upon request from the authors). This data is useful to labor market intermediaries in identifying which new training programs are needed in the community and how many individuals will need those skills.

Table 8: Specific Occupations, by Job Zone, Impacted by the Automobile Manufacturer Scenario\*

Occupation Title	No. of Jobs	Average Hourly Wage
<i>Job Zone 1</i>		
General Office Clerks	44	\$9.66
Truck Drivers, Heavy or Tractor-Trailer	38	\$13.98
Cashiers	36	\$6.94
All Other Helpers, Laborers, and Material Movers, Hand	27	\$9.88
Truck Drivers, Light, Include Delivery and Route Workers	25	\$10.31
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	24	\$8.94
All Other Hand Workers	22	\$14.77
Waiters and Waitresses	22	\$5.88

<i>Job Zone 2</i>		
Assemblers and Fabricators, Except Machine, Electrical, Electronic, and Precision	103	\$13.68
Salespersons, Retail	51	\$8.80
Secretaries, Except Legal and Medical	34	\$11.31
Bookkeeping, Accounting, and Auditing Clerks	29	\$11.20
Sales Representatives, Except Retail and Scientific and Related Products and Services	27	\$19.09
Automotive Mechanics	24	\$12.87
<i>Job Zone 3</i>		
First-Line Supervisors and Managers/Supervisors - Sales and Related Workers	26	\$17.13
First-Line Supervisors and Managers/Supervisors - Clerical and Administrative Su	21	\$15.43
<i>Job Zone 4</i>		
All Other Engineers	21	\$28.60
<i>Job Zone 5</i>		
General Managers and Top Executives	56	\$28.88

\* Only includes those occupations in which 20 or more jobs were created.

The major implication of this impact for labor market intermediaries is the same as that from the first case study. Since such a high proportion of employment in either scenario will be in jobs that do not require specific training and experience, labor market intermediaries should consider developing job readiness programs to facilitate long-term employment in these jobs. In addition, Table 8 provides a list of occupations for which significant demands will exist so that intermediaries who do provide training can identify the critical skills to address in their programs.

## Conclusions

Theodore and Carlson (1998) present a methodology for creating timely and localized occupation estimates that can be easily incorporated into economic development strategies. Their approach focuses on assessing the state of the current labor market. We extended their methodology by using input-output analysis to generate forecasts of the impacts of various structural changes on the growth in various types of occupations and their corresponding training requirements. We then applied this methodology to examine the impacts of two separate events on jobs accessible to the poor—jobs that require little to no education, training or experience. We found that in three of the four targeted clusters, nearly 50% of the jobs generated from the Chattanooga Regional Growth Initiative would be jobs which are classed as Job Zone 1, requiring no high school diploma/GED and no training or prior experience. For the VAAP site case study, the automobile plant creates over 700 more jobs in Zones 1 and 2 than the computer plant, giving a clear choice to government officials who are concerned about the poor. In addition, we found that the jobs created in both studies provide an economically empowering wage capable of lifting individuals and families above the poverty line.

For labor market intermediaries, the implication is clear from both case studies: job readiness training is needed. Given the high proportions of new jobs that would require little or no training and/or education, labor market intermediaries should be ready to service the employers and job seekers through job readiness training – training focused on attitudes, work ethics, interpersonal communication and job finding techniques.

## Bibliography

- Austrian, Ziona. 2000. "Cluster Case Studies: The Marriage of Quantitative and Qualitative Information for Action." *Economic Development Quarterly*, 14(1): 97-110.
- Bairak, Roman I. and David W. Hughes. 1996. "Evaluating the Impacts of Agricultural Exports on a Regional Economy." *Journal of Agricultural and Applied Economics*, 28(2): 393-407.
- Bergstrom, John C. 1990. "Economic Impacts of State Parks on State Economies in the South." *Southern Journal of Agricultural Economics*, 22(2): 69-77.
- Crihfield, John B. and Harrison S. Campbell, Jr. 1991. "Evaluating Alternative Regional Planning Models." *Growth and Change*, 22(2): 1-16.
- Hill, Edward W. and John F. Brennan. 2000. "A Methodology for Identifying the Drivers of Industrial Clusters: The Foundation of Regional Competitive Advantage." *Economic Development Quarterly*, 14(1): 65-96.
- Hughes, David W. and Vaneska N. Litz. 1996. "Rural-Urban Economic Linkages for Agriculture and Food Processing in the Monroe, Louisiana Functional Economic Area." *Journal of Agricultural and Applied Economics*, 28(2): 337-355.
- Kurre, James A., Kenneth T. Louie, and Barry R. Weller. 1993. "Forecasting Occupational Trends for a Small Metro Area." Paper presented at the 40<sup>th</sup> North American Meetings of the Regional Science Association International, Houston, TX: November 11-14, 1993.
- Minnesota IMPLAN Group, Inc. IMPLAN Professional version 2.0.1017. 1725 Tower Drive West, Suite 140, Stillwater, MN 55082, [www.implan.com](http://www.implan.com), 1997.
- Occupational Information Network (O\*NET<sup>TM</sup>) 3.0. O\*NET is a registered trademark of the U.S. Department of Labor, Employment and Training Administration. <http://www.onetcenter.org>
- Porter, Michael. 2000. "Location, Competition, and Economic Development: Local Clusters in a Global Economy." *Economic Development Quarterly*, 14(1): 15-34.
- Theodore, Nikolas and Virginia L. Carlson. 1998. "Targeting Job Opportunities: Developing Measures of Local Employment." *Economic Development Quarterly*, 12(2): 137-149.
- Waits, Mary Jo. 2000. "The Added Value of the Industry Cluster Approach to Economic Analysis, Strategy Development, and Service Delivery." *Economic Development Quarterly*, 14(1): 35-50.
- Walton, Judy. 2000. "City, County Eager for VAAP Handover." *Chattanooga Times-Free Press*, September 22, 2000.

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<sup>1</sup> Of the 528 institutions in IMPLAN, ten of these sectors were excluded from our analysis due to their inappropriateness to our study. See Appendix 1 for more information about why these sectors were excluded.

<sup>2</sup> For some industries within the IMPLAN national staffing patterns matrix, the sum of the proportions that each occupation represented did not sum to 1. So, the aggregated occupational codes were included in the analysis as “other” categories, in which the residual proportions were assigned to the appropriate aggregated occupation code (residuals existed at all levels of aggregation so that these residuals were assigned to the lowest level of aggregation possible). Thus, there are 819 occupations utilized in our analysis, as opposed to the 780 disaggregated codes found in the OES and EP data sets. The IMPLAN staffing patterns matrix also preserved the industry-specific wage data for each occupation from the original OES/EP data sets.

<sup>3</sup> National staffing patterns were used to construct our occupation projections for two reasons. First, they were readily available from MIG. Second, national staffing patterns are believed to produce more accurate labor market projections because local labor markets tend to converge toward the national average over time.

<sup>4</sup> Since an SVP cannot be calculated for aggregated occupation codes (i.e., our “other” categories), we assigned the most common job zone category within the occupational group as the job zone for the aggregated occupation code.

<sup>5</sup> This problem arises with the other clusters as well. For Confectionery and Baked Goods, IMPLAN aggregates food retailers (grocers, meat markets, fruit and vegetable vendors, etc.) into a single sector where Porter might use only one of these industries in his cluster definition. This problem occurs again with Miscellaneous Retail. IMPLAN aggregates all of SIC 59—as one sector, but the cluster definition of Hospitality and Tourism on includes Gift and Novelty Stores, SIC code 5947.

<sup>6</sup> In addition to a large, poor inner-city population, the Chattanooga region has difficulty retaining skilled and educated labor due to the perceptions of low wages and lack of opportunities for these workers.

<sup>7</sup> Multiplying the hourly wage by 2,040 hours (40 hrs/wk times 52 weeks) annualizes hourly wages. This is the methodology suggested by the US Department of Labor, Bureau of Labor Statistics.

<sup>8</sup> For our purposes, the poverty line was defined as the US Department of Health and Human Services Poverty Guidelines, which are established every 10 years based upon the decennial census and adjusted annually for inflation. The Poverty Guidelines are the qualifying income levels for many federal and state welfare programs. In 2000, the Poverty Guideline for a family of 4 was \$17,050.

<sup>9</sup> The data used to compute these wages for each occupation are from national averages. Hence, they are accurate reflections of Chattanooga's situation to the extent that Chattanooga's labor markets follow national trends. Clearly, this is more likely to be true in the long-run than in the short-run.

<sup>10</sup> The results presented in Table 5 are only suggestive since other factors affect the demand for workforce development activities, such as the extent to which the skills already exist in the workforce, the state of the labor market/local economy, and the present existence of appropriate training programs.

<sup>11</sup> Regional average hourly wages for Chattanooga were provided by the Chattanooga Area Chamber of Commerce, and they are available on-line at:

<http://www.chattanooga-chamber.com/economicdev/communitydata/workforce2.htm#market>.