

**Tapping IMPLAN's Data Mine to Identify and Analyze
Regional Industries and Industry Clusters for Connecticut**

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I. Introduction

This paper presents methodologies for using the data available in IMPLAN, a comprehensive regional input-output model, to analyze regional industries and industry clusters. An input-output (I-O) model provides a unique and valuable tool for examining regional industrial structures and exploring existing and potential regional industry linkages. There are a number of methodologies published in the economic development literature that use data from I-O models to identify industries that are regionally important either because of their size (driver or exporting industries) or because they are closely related in economically important factors (cluster industries). This paper will review three such methodologies and propose additional analyses using the unique data set available in such I-O models.

Background

The background for this paper comes from research by a team of economists from the University of Connecticut, the Connecticut Department of Labor, the Connecticut Department of Economic and Community Development, and CERC. This research was undertaken to assess Connecticut's existing industry clusters and identify potential or emerging clusters. Connecticut's existing industry clusters were the result of a successful policy initiative started during the difficult recession in the early 1990s. At that time Connecticut began to actively pursue an economic development policy that leveraged the industry cluster concept. This policy sought to strengthen an economy confronting a variety of structural challenges by encouraging better communication between business and political leaders and among businesses. The development of an industry cluster component in Connecticut's economic development strategy also improved understanding of the state's economy among economic development professionals and policy makers. Under this strategy potential industry clusters were identified and the development of an industry cluster organization was encouraged. This organization was dedicated to exchanging ideas

among the companies within the cluster to stimulate productivity and competitiveness. Once formed the industry cluster organizations also serves as a voice for the companies in the development of legislative policies and in the national and international economies. The focus of this paper is on the methodologies used by this research group to identify and explore industry clusters in Connecticut rather than on the results of the research that have been reported elsewhere.

It is worth noting that the functional regional economy is probably significantly different from the regional economy that was defined for this research due to the political requirements related to working within the state boundaries.

Defining the Industry Cluster Concept

Developing a clear definition of the term “cluster” can be a difficult task due to multiple concepts all legitimately represented by the term. As a result, cluster definitions, as well as the industries identified by the different definitions, are often overlapped and intertwined. A summary of groupings that are often referred to as industry clusters include:

1. A single industry which shows a high concentration of firms, employment, and output in a local geography (Porter’s cluster of competitive firms.)
2. A group of closely related industries that produce the same commodities
3. A group of industries that have all been affected by the same changes in the structure of the regional or national economy
4. A group of industries that have similar labor requirements
5. A group of industries that have similar technology inputs
6. A group of industries that are linked by production and or distribution functions

7. A group of industries that have similar resource requirements (Held's horizontal industry clusters.¹)

The regional agglomeration of firms within one industry as noted by Michael Porter² and others is also legitimately called a cluster but is a cluster of firms not a cluster of industries. Such a cluster often results in the development of a competitive industry and can lead to industry clusters but by itself a cluster of firms within an industry is beyond the scope of the methodologies reviewed in this paper. Carefully choosing the definition or set of definitions at the start of a project evaluating regional clusters will help determine the methodology applied and will keep the project focused. Multiple methodologies should be used with caution; the resulting industry clusters identified from different methodologies often have only limited overlapping cluster groups and combining the results into a concise analysis can be difficult. As we learned with our research project, each of the three methodologies resulted in three intertwined industry cluster groups. When the same industries showed up in the same clusters from the different methodologies interesting perspectives on the regional economy could be inferred however, often the industries within a cluster from one methodology failed to be present in just one or two clusters from another methodology. Indeed, we felt at times like the blind men describing the elephant after each had observed a different aspect of the same entity. Nevertheless, each cluster methodology provided important perspectives into the regional industrial structure and choosing to focus solely on one or two aspects of the interactions of a complex regional economy can easily result in missing important industry groupings. A balance is often achieved in regional industry cluster projects by combining the quantitative mathematical procedures with more qualitative methods such as surveys and focus groups.

¹ Held, James R. "Clusters as an Economic Development Tool: Beyond the Pitfalls," *Economic Development Quarterly*, vol. 10 no. 3 August, 1996. pp 249-261.

² Porter, Michael *The Competitive Advantage of Nations* (New York: Free Press, 1990)

Because the methodologies discussed in this paper use components from many of the groupings presented above, a cluster will be defined as a group of related industries located in the same region.³ The specific way in which the industries are related will depend on the data and the methodologies used to identify the clusters. The temptation to narrowly define industry clusters as groups of industries related in their input or output functions must be resisted because, even though all three methodologies use I/O data, only one industry cluster identification methodology clearly determines industry clusters based solely on that I/O data.

Identifying Regional Industry Clusters with I-O Data

There are a number of features of an I-O model that make it a valuable tool for defining clusters within an economic region. Some of these features may be unique to IMPLAN but many are part and parcel of any I-O model. Briefly these include:

1. The ability to define a unique economic region, typically a county or multi-county aggregate
2. Data estimates for a large number of industries and commodities
3. The ability to examine commodities made by industries
4. Estimates for a large number of economic variables, both required and produced by the model
5. Data estimates for production and distribution functions with estimates for regional shares
6. The ability to make adjustments to the default data estimated for an industry or group of industries in a region
7. A national industry I-O model for benchmarking the specific region of study.
8. The ability to back into the Access database used by IMPLAN to extract, aggregate or manipulate data with queries

³ Held James R., p251

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These features all contribute to the value of the IMPLAN model. However, for doing the type of industry structure analysis discussed in this paper, the ability to link into the IMPLAN database using Access has proven to be extremely valuable. This feature allows the researcher to produce customized reports and data files for specific industries and industry groups, link and compare data across models, and create reports from a full industry model for a unique group of aggregate industries. While the IMPLAN software provides the ability to aggregate a group of industries before constructing a model, even more valuable is the ability to explore the regional economy by selecting an industry or industry group and tracing the forward and backward linkages as well as aggregating the industry data from the model up to a standard industry stub.

Indeed, one of the most useful functions that we found with linking into Access is the ability to work with the full 500+ industry detail model using the existing functions within the IMPLAN software and then aggregate the data up to an industry grouping that matches the Standard Industrial Classification (SIC) industry codes to extract the data or develop tables. This allows the researcher to take industry data from the IMPLAN model and compare it to data from other sources or use it in the development of a more extensive model. Table 1 presents the basic structure and a few of the industry rows for the table used to create SIC industry data from IMPLAN data.

Table 1—Industry Aggregation Demonstration Table			
Implan #	SIC 2 & 3 Digit	Sort Number	Industry Name (SIC-IMPLAN)
42	145	111450	Clay, Ceramic, & Refractory Materials
43	147	111470	Chemical & Fertilizer Mineral Mining
44	147	111470	Chemical & Fertilizer Mineral Mining
45	147	111470	Chemical & Fertilizer Mineral Mining
46	148	111480	Nonmetallic Minerals Services
47	149	111490	Misc Nonmetallic Minerals
48	15A	111500	Construction
49	15A	111500	Construction
50	15A	111500	Construction
51	15A	111500	Construction
52	15A	111500	Construction

Table 1—Industry Aggregation Demonstration Table			
Implan #	SIC 2 & 3 Digit	Sort Number	Industry Name (SIC-IMPLAN)
53	15A	111500	Construction
54	15A	111500	Construction
55	15A	111500	Construction
56	15A	111500	Construction
57	13A	111380	Oil and Gas Field Services
58	201A	202010	Meat and Dairy products
59	201A	202010	Meat and Dairy products
60	201A	202010	Meat and Dairy products
61	201A	202010	Meat and Dairy products
62	201A	202010	Meat and Dairy products
63	201A	202010	Meat and Dairy products
64	201A	202010	Meat and Dairy products
65	201A	202010	Meat and Dairy products

The column “IMPLAN #” has data for the IMPLAN industry number. The “SIC 2 & 3 Digit” column has the two or three digit SIC code that corresponds to the IMPLAN industry. The “Sort Number” Column has a number to allow for consistent sort orders. The “Industry Name (SIC-IMPLAN)” column has a brief industry description. An Access summation query that joins this table to an IMPLAN table containing industry data will result in the IMPLAN industry data being aggregated to the appropriate SIC industries. The query should group on “Sort Number,” “SIC 2 & 3 Digit,” and “Industry Name (SIC-IMPLAN)” columns. A similarly constructed table can also be used to aggregate data from a more detailed SIC industry level to the same industry groups used in the above table.

Exploring Regional Industry Clusters Using I-O Data

Research using industry cluster definitions that analyze a regional industrial structure by looking at linkages will benefit through applying I-O data. This type of research can include addressing issues such as:

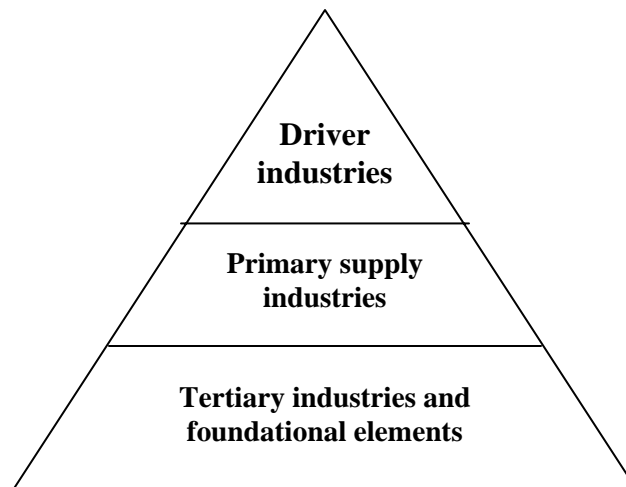
1. What industries are exporting goods and services outside of the region (driver industries)?
2. What regional industries are supplying inputs to the major regional exporting or driver industries?

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3. How much of the input requirements for the driver industries are supplied locally? (Regional Purchase Coefficients)
4. Are there gaps in the regional industry structure that if filled could result in a stronger regional structure? (Import substitution)
5. What industry structure is necessary to supply goods to the secondary industries?
6. What industries produce the same commodities as those identified?

Based on the above discussion there are a couple graphical models that are useful in considering the structures industrial clusters.

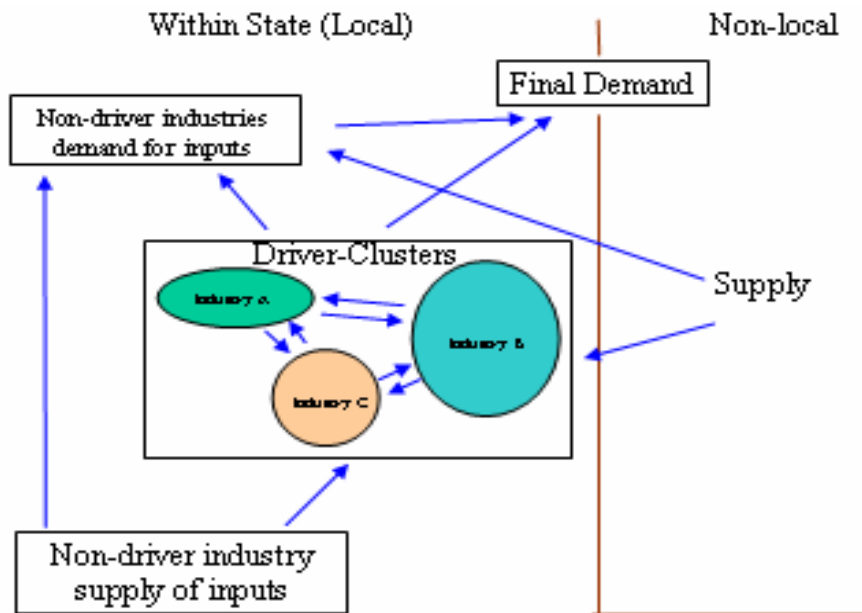
The first is a one-dimensional model based on a triangle. This triangle shows the most important group of regional industries (called the driver industries) at the top of the triangle. These drivers are important because they are nationally or internationally competitive, have a relatively high concentration of employment



and/or output, have a significant amount of regional employment, and enhance the region's wealth.

These drivers are supported by a number of supply industries which provide inputs to the drivers. The supply industries, as well as the drivers and are supported by a

group of industries providing goods and services primarily to the local economy. This model fits nicely into an I-O analysis with the direct effect being at the top, the immediate supply industries represented by the indirect effect, and the induced effect represented by the base of the triangle. The industry cluster concept can be imbedded in this model by considering a group producing similar commodities or closely linked being either in the driver industry or among the primary supply industry group. An example of a cluster being a group of industries supplying a driver industry is Connecticut's Aerospace Components Cluster which is a group of industries that supply inputs for Connecticut's large aerospace companies. The second graphic expands the one-dimensional model by showing local and non-local



economies and multiple driver industries providing inputs to each other as well as to other industries and to final demand. This graphic also shows that inputs and output come from both within and outside the region.

II. Review of three cluster identification methodologies that use I-O data

As noted above, three different cluster identification methodologies aided the exploration of Connecticut's industrial structure. These methodologies provided three unique perspectives on Connecticut's clusters. In grouping Connecticut's industries each perspective answered important questions related to what the most important industries were, what economic factors appeared to be most important for which groups of industries and which industries clustered together based on the other local industries they purchased from and distributed their output to. As could be expected from methodologies, the results provided three industry classifications that grouped some industries together providing additional economic insights but also resulted in significant intertwining of some industries among the resulting groups that suggested no summary clusters from the three methodologies could be proposed for those industries. The complete analysis, which is described elsewhere, examined the results of the three analytic approaches to create a proposed set of industry clusters and then to examine both the proposed industry clusters and the individual industries through the distinct methodological lenses.

The following discussion reviews the data requirements, especially the I-O data, and summarizes the methodological steps.

A. Research and Planning Department of the Missouri Department of Economic Development⁴

Perhaps the simplest, at least mathematically, methodology focused primarily on identifying local driver industries. This methodology was from the *Target Missouri*

⁴ Target Missouri II: A Regional Approach to Economic Development. Missouri Department of Economic Development. Research and Planning, http://www.ecodev.state.mo.us/research/pubs/tm2/centreg/tm2_centreg_rpt.pdf Accessed fall 2000.

II: A Regional Approach to Economic Development. This methodology, developed by the Research and Planning Department of the Missouri Department of Economic Development, is primarily useful in identifying regional industrial “driver” industries but, because it includes data developed from an I-O model, a brief review of this methodology is included in this review. *Target Missouri II* provides a simple but comprehensive methodology that uses a number of economic variables to examine a regional industrial structure. The Connecticut research team used this methodology to provide a summary framework to identify the major industry components and note which clusters the driver industries were being classified in by the other cluster methodologies.

The Missouri methodology uses six different measures of industry strength to identify industries that are important in a economic region. The specific variable used from an I-O model, the “Economic Impact Analysis” variable, was composed of the multipliers for employment and wages. The Missouri researchers used estimates of industry impacts for employment and wages from Regional Economic Models, Inc. (REMI). Their specific methodology involved taking the average employment impact over the first five years from adding 100 new jobs to each industry and the net present value of the total wage and salary impact over the first five years from the wage and salary impact resulting from those 100 jobs. The Missouri research group then normalized the impacts for both employment and wages/salaries using z-scores and averaged the two z-scores to create a single index.

Although the Connecticut team had the REMI model available, the REMI model did not possess the level of industry detail needed, so the IMPLAN employment and wage/salary multipliers were used.

The other variables used in the Missouri methodology included a specialization ratio, a regional shift measure (from a shift-share analysis), a skills-mismatch index, an industrial mix component (from a shift-share analysis) and a current employment level. These five measures, along with the economic impact multiplier measure, were used to rank regional industries for targeting. The specific ranking

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methodology used awarded an industry a specific number of points for each of the measures, based on whether the industry reached a threshold or not. As a result, the final ranking produced by this methodology allowed for each industry measure to be weighted based on the perceived importance of the measure. The sum of all industry measures for any given industry ranged between 0 and 100. This sum allowed for the industries to be ranked and clustered based on their rankings. The industries with the highest rank were considered a regional cluster of driver industries while those with lower ranks could be classified as important support industries or general industries.

B. Hill and Brennan⁵

The Hill-Brennan approach used eleven economic variables to identify the competitive base of the Cleveland MSA economy by using mathematical clustering and discriminant analysis. Four of the eleven variables were extracted from the IMPLAN model. These included:

1. Regional industry export shares: How much does industry export from the region as a share of total regional exports?
2. U.S. industry export shares: How much of the industry's total (U.S.) export comes from the region?
3. Locally used Inputs by the industry (Centrality-backward links.) How much does the industry buy locally? Share of total inputs that come from regional industries?
4. Locally shipped industry outputs for further production (Centrality-forward links.) How much does the industry sell locally?

The Hill-Brennan methodology also included seven economic variables to measure the regional revealed competitive advantage, employment growth, productivity, and

⁵ 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, 65-96.

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earnings. All variables were based on industry data and were aggregated to the industry grouping that allowed for both IMPLAN data and SIC data.

After gathering the data the industries were clustered together using the mathematical grouping procedure called agglomerative hierarchical cluster analysis. This procedure results in suggested candidate industry cluster solutions. It is important to realize that a majority of the variables used in this methodology are not specifically related to the concept of linked industries. Thus, the results from this methodology would not necessarily be a grouping of industry clusters consistent with an I-O cluster definition. Indeed, when run for the Connecticut industry groups the clusters that resulted did not tend to follow supply and demand industry linkages. One of the primary clusters identified by this methodology was made up of Aircraft and Missile Engines and Parts (SIC 372) and Insurance Carriers (SIC 63). While this is a strange cluster when considered from an industry linkage concept, it is entirely appropriate for the data and mathematical clustering procedure used.

In fact, when the stepwise discriminant analysis was applied the reason for this strange industry cluster became clear. Stepwise discriminant analysis tests the statistical validity of the groupings and can show which variables were responsible for the groupings. For the Aircraft and Missile Engines and Parts and Insurance Carriers cluster the economic variables primarily responsible for the clustering were high industry export shares, a variable from the I-O model (but not one concerned with the industry linkages,) and two variables that measured significant declines in industry employment.

After the mathematical/statistical procedures outlined above, Hill and Brennan conducted a survey to confirm that the economic factors identified in their initial mathematical and statistical procedures were concerns of the businesses in the region.

When the mathematical clustering and discriminant analysis methodology was applied to Connecticut's industrial structure the clusters that resulted clearly reflected industry groups facing similar challenges, endowed with similar economic

characteristics, or had experienced similar historical trends. For example, as noted above, this methodology grouped together the Insurance Carriers and Aircraft and Missile Engines and Parts industries because of the core underlying economic issues including high labor costs, international competition, and industry re-structuring. This type of knowledge would be important in considering economic development strategies for the region, as well as developing legislative policies and programs.

C. Feser and Bergman⁶

Feser and Bergman's methodology that we used was solely based on I-O data for manufacturing industries and resulted in a grouping of industries according to the I-O linkages. For their first step, they created two coefficient matrices from an I-O transactions matrix. The cells of the "buy" matrix were defined as the shares of the purchases from all other industries and the matrix was formed by dividing each cell value by its columns total. The cells of the "sell" matrix were defined as shares of sales from all other industries and dividing each cell by its row total formed this matrix. The sell matrix was transposed to conceptually match the structure of the buy matrix.

Feser and Bergman then placed the buy and sell matrices together and correlated all columns to create a square industry-by-industry correlation matrix filling in the correlations both above and below the diagonal. Within this industry-by-industry matrix the four smaller square matrices representing the four possible industry-by-industry relationships were separated into their own square matrices. These four matrices were industry correlations of buy-buy, buy-sell, sell-buy and sell-sell.

For the next step in their methodology, Feser and Brennan created a matrix from the maximum industry-by-industry correlations from each of these four correlation matrices (excluding the 1.00s). This created a final square matrix of maximum

⁶ Feser, E. and E. Bergman, National Industry Cluster Templates: a Framework for Applied Regional Cluster Analysis, Regional Studies, 34/1. pp 1-19.

correlations. This maximum correlations matrix thus holds measures of the strongest regional linkages of every industry to every other industry, regardless of the direction of the linkage.

Feser and Bergman's methodology then applied factor analysis using principal components (varimax) to identify groups of industries with similar I-O linkages. This procedure reduces the industry-by-industry maximum correlation matrix to a matrix of smaller dimensions in which the common variation among the industry correlations is reduced to a simpler set of variables (principal components). The result of this procedure is that each industry is given a factor loading value that weights how well that industry is associated with the given principal component or cluster. These factor loading values were then used to identify which industries belonged to each of the clusters (principal components). Industries with a factor loading value of greater than or equal to 0.75 were considered to be the primary industries for that cluster. Secondary industries for that cluster had factor loading values between 0.50 and 0.75. Secondary industries were considered moderately identified with the given cluster. Factor loading values between 0.35 and 0.50 were considered to be part of a tertiary set of industries for that cluster that were loosely identified with the cluster.

Feser and Bergman applied this methodology to both the national and regional transactions matrix. They used the national matrix as a baseline and compared the clusters identified from the national matrix with regional clusters to detect gaps in production chains, regional specializations, or potential emerging clusters.

III. Methodology Review and an Examination of Regional Industry Clusters Using IMPLAN

The three methodologies reviewed above were developed to identify regional industry drivers or clusters. As pointed out, all three use data from an I-O model in their analysis. The Bergman and Feser methodology comes closest to identifying industry clusters based on a strict definition of an industry cluster being a group of

industries linked by inputs and/or outputs. However, much of the information on inter-industry linkages present in the initial production and distribution matrices is reduced as their methodology proceeds toward their final solution of industries with similar underlying I-O structures.

While such a reduction is necessary to create a functional and descriptive cluster of industries, it was observed during our research that applying the I-O information present in a regional economic impact model such as IMPLAN could lead to important perspectives on a regional economy. It is with this in mind that the following discussion outlines some of the basic work that can be done to measure and evaluate regional industrial linkages. There are undoubtedly many different table structures that could be generated using these types of procedures and the work shown below only introduces this type of exploration.

Review of Regional Industry Cluster Tables based on Input/Output Linkages.

The IMPLAN Regional Industry Balance reports show industry production functions. The commodities in these production functions are the commodities produced by any industries, rather than the given industry's total production of all commodities. The transactions matrix gives the industry-by-industry regional production requirements and can be imported into Access. The total (regional and non-regional industry production function is also needed for the following tables. Although this data is probably available in the IMPLAN database a set of queries were written to acquire both the regional and total industry-by-industry input requirements. Although these queries are not reviewed in this paper it is perhaps worth noting that in the sequence of queries also produces a table that has detailed commodity data that could provide additional cluster information.

The result of this set of queries is an industry-by-industry gross and regional purchases matrix. In Access, the table is structured as follows:

Table 2—Industry-to-Industry Transactions			
Ind_i	Ind_K	Gross Inputs	Rgn Inputs
1	1	\$23,290	\$4,712
1	2	\$17,186	\$3,477
1	3	\$3,004	\$608
1	4	\$239	\$48
1	5	\$493	\$100
1	6	\$123	\$25
1	7	\$381	\$77
1	9	\$38,247	\$7,738
1	11	\$85,297	\$152
1	12	\$593,961	\$21,141
1	13	\$10,992,019	\$391,234
1	14	\$24	\$5

Where the column “ind_I” identifies the “column” industry in a transactions matrix and the column “ind_K” identifies the “row” industry. The result of these 4 queries is an industry-by-industry gross and regional input matrix. The “Rgn Inputs” column of this table should be very close to the values given in the transactions table that can be exported from IMPLAN.

Based on the total and regional transactions data from IMPLAN, the aggregate inputs for a regional industrial cluster could be presented in one table such as that shown below in Table 3. The data for the industries in Table 3 have been aggregated to an SIC industry structure using a table like Table 1 shown above. The SIC industry structure was then further aggregated to a set of industry clusters identified using each of the three cluster methodologies identified above. The ranking column ranks the industries based on total regional inputs. Connecticut’s Transportation and Distribution Cluster is ranked 1 because it has \$4,079 million in local inputs. The input value is shown for both the gross and regional inputs. The total value of all inputs for all drivers is \$44,094m while the total value of their regional inputs is \$25,091m. The Regional Purchasing Coefficient or RPC column shows the share of the total inputs for a given industry that are purchased locally (Regional/Total). 56.6% of the inputs required by all the identified driver clusters are from local sources. The Share of Connecticut Total column shows the industry’s share of total

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and regional inputs relative to the total requirements for Connecticut. The identified driver clusters use a total of 55% of all inputs required by Connecticut’s industries with 34% of these being from local sources. The Share of CT Regional Inputs column shows the industry’s share of total regional inputs. Connecticut’s driver industry clusters use 57.3% of locally purchased inputs from all industries in Connecticut.

Table 3—Inputs Required By Industries in Connecticut

Ranking	Driver-Cluster Name	Input Values		RPC	Share of Connecticut Total		Share of CT Regional Inputs
		Total	Regional		Total	Regional	
	Total All Industries	\$79,485	\$43,526	54.8%	100.0%	54.8%	100.0%
	Total for All Drivers	\$44,094	\$24,951	56.6%	55.5%	31.4%	57.3%
1	Transportation & Distribution	\$6,506	\$4,079	62.7%	8.2%	5.1%	9.4%
2	Business Support Services	\$6,291	\$3,554	56.5%	7.9%	4.5%	8.2%
3	Infrastructure Health & Human	\$5,203	\$3,435	66.0%	6.5%	4.3%	7.9%
4	Tech Mfg	\$5,943	\$2,774	46.7%	7.5%	3.5%	6.4%
5	Aerospace/Defense	\$5,760	\$2,712	47.1%	7.2%	3.4%	6.2%
6	Local Financial Services	\$2,908	\$2,074	71.3%	3.7%	2.6%	4.8%
7	Insurance	\$3,913	\$1,577	40.3%	4.9%	2.0%	3.6%
8	Tourism Entertainment Leisure	\$2,526	\$1,527	60.4%	3.2%	1.9%	3.5%
9	Financial	\$2,173	\$1,276	58.7%	2.7%	1.6%	2.9%
10	Drugs	\$1,408	\$1,015	72.0%	1.8%	1.3%	2.3%
11	Private Education Export Base	\$966	\$715	74.0%	1.2%	0.9%	1.6%
12	Agriculture, forestry, & fishing	\$496	\$213	42.9%	0.6%	0.3%	0.5%
	All non-driver Inds	\$35,391	\$18,575	52.5%	44.5%	23.4%	42.7%

Source: IMPLAN 1997 Data Matrices. Millions of dollars, nominal.

Table 4 uses the same table structure but shows the detail input requirements for the Transportation and Distribution cluster.

Table 4--Inputs Required By Connecticut’s Transportation and Distribution Cluster							
Ranking	Driver-Cluster Name	Input Values		RPC	Share of Connecticut Total		Share of CT Regional Inputs
		Total	Regional		Total	Regional	
	Total All Industries	\$6,506	\$4,079	62.7%	100.0%	62.7%	100.0%

Table 4--Inputs Required By Connecticut's Transportation and Distribution Cluster							
Ranking	Driver-Cluster Name	Input Values		RPC	Share of Connecticut Total		Share of CT Regional Inputs
		Total	Regional		Total	Regional	
	Total for All Drivers	\$4,256	\$2,821	66.3%	65.4%	43.4%	69.2%
1	Transportation & Distribution	\$1,791	\$1,382	77.1%	27.5%	21.2%	33.9%
2	Business Support Services	\$1,507	\$885	58.8%	23.2%	13.6%	21.7%
3	Infrastructure Health & Human	\$371	\$252	67.9%	5.7%	3.9%	6.2%
4	Tech Mfg	\$298	\$158	53.0%	4.6%	2.4%	3.9%
5	Aerospace/Defense	\$159	\$81	50.6%	2.5%	1.2%	2.0%
6	Local Financial Services	\$39	\$26	66.9%	0.6%	0.4%	0.6%
7	Insurance	\$29	\$17	57.9%	0.4%	0.3%	0.4%
8	Tourism Entertainment Leisure	\$51	\$14	26.8%	0.8%	0.2%	0.3%
9	Financial	\$8	\$5	58.0%	0.1%	0.1%	0.1%
10	Drugs	\$3	\$2	80.0%	0.0%	0.0%	0.1%
11	Private Education Export Base	\$2	\$1	47.4%	0.0%	0.0%	0.0%
12	Agriculture, forestry, & fishing	\$1	\$0	65.6%	0.0%	0.0%	0.0%
	All non-driver Inds	\$2,249	\$1,258	55.9%	34.6%	19.3%	30.8%

Source: IMPLAN 1997 Data Matrices. Millions of dollars, nominal.

Table 5 shows the supply requirements from all the driver industry clusters for the largest 15 non-driver industries.

Table 5--Non-Driver Industry Detail of Requirements from All Driver Industries							
Ranking	Driver-Cluster Name	Input Values		RPC	Share of Connecticut Total		Share of CT Regional Inputs
		Total	Regional		Total	Regional	
	Total	\$15,063	\$6,955	46.2%	19.0%	8.8%	34.2%
1	Construction	\$1,496	\$1,403	93.8%	1.9%	1.8%	3.4%
2	Motor freight & warehousing	\$554	\$419	75.6%	0.7%	0.5%	1.3%
3	U.S. Postal Service	\$545	\$409	75.0%	0.7%	0.5%	1.2%
4	Electronic components and accessories	\$888	\$360	40.5%	1.1%	0.5%	2.0%
5	Research and testing services	\$461	\$303	65.6%	0.6%	0.4%	1.0%
6	Advertising	\$363	\$290	80.0%	0.5%	0.4%	0.8%
7	Services to buildings	\$356	\$285	80.0%	0.4%	0.4%	0.8%
8	Engineering & architectural	\$292	\$233	79.7%	0.4%	0.3%	0.7%

Table 5--Non-Driver Industry Detail of Requirements from All Driver Industries							
Ranking	Driver-Cluster Name	Input Values		RPC	Share of Connecticut Total		Share of CT Regional Inputs
		Total	Regional		Total	Regional	
	services						
9	Paperboard Containers & Boxes	\$203	\$195	96.1%	0.3%	0.2%	0.5%
10	Newspapers	\$241	\$187	77.5%	0.3%	0.2%	0.5%
11	Search and navigation equipment	\$302	\$167	55.4%	0.4%	0.2%	0.7%
12	Misc. equipment rental & leasing	\$233	\$139	59.4%	0.3%	0.2%	0.5%
13	Misc. Repair Shops	\$170	\$136	80.0%	0.2%	0.2%	0.4%
14	Motion Pictures	\$209	\$130	62.2%	0.3%	0.2%	0.5%
15	Periodicals	\$183	\$130	71.0%	0.2%	0.2%	0.4%

Source: IMPLAN 1997 Data Matrices. Millions of dollars, nominal.

Additional tables that have not been shown in this paper but would be important to consider include:

1. Use of the industry-by-commodity table to examine similar industries based on their commodity output.
2. Comparisons to other regional matrices including the U.S.

IV. Conclusion:

Each of the three methodologies presented above analyze a regional industrial structure and group or cluster industries. However, each methodology is significantly different in both data inputs and mathematical/statistical procedures, and address different aspects of the regional industry structure. Thus, as would be expected, the industry groupings derived from each methodology are different, and combining the results from these three methodologies into a single industry summary structure creates a significant challenge. In many ways it may be best to pursue a comprehensive regional industrial analysis by determining a methodology to identify a group of industries perceived to be important to the region and then examining that group using the methodologies discussed above. Such a procedure would allow the researchers to examine factors that have influenced those industries, identify other

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industries that may have been effected by the same factors, and identify what industries have similar inter-industry linkages and what those specific linkages are.

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