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A Methodology to Rank Industries According to their Marginal Economic Impact: Case Studies for the First Congressional District of Tennessee and the Knoxville Metro Area.

Introduction

This paper presents a methodology which allows one to rank industries according to their marginal economic impact. The marginal economic impact for a given industry, industry X, for example, is measured as the “change in total earnings paid to households employed in all industries for each job created or lost in industry X.” The marginal economic impact is not the same as an industry’s total contribution to the local economy. Some service industries provide thousands of jobs in the local economy, but have small marginal economic impacts, whereas some manufacturing industries with far fewer employees have large marginal impacts.

The marginal economic impacts may be used to answer questions, such as: (a) how do industries rank in terms of their marginal economic impact? Put another way, how many jobs in industry X are required to have the same economic impact as one job in industry Y? (b) What is the economic impact of a new retail development? (c) What is the economic impact of the gain or loss of 100 jobs in a particular industry? These are just a few of the questions that may be answered with the aid of marginal analysis.

Marginal economic impacts were calculated for industries with 1,000 or more employees in the First Congressional district of Tennessee and in the Knoxville metro area (MSA). These impacts are presented in Tables 1 and 2, ranked from largest to smallest. However, the methodology presented in this paper enables one to estimate the marginal economic impact for each of the 61 industries listed in appendix Tables A1 and A2.

The First Congressional District of Tennessee includes the counties of Carter, Cocke, Greene, Hamblen, Hancock, Hawkins, Johnson, Sullivan, Unicoi, Washington, and parts of Jefferson and Sevier counties. The Knoxville metro area (MSA), as defined by the U.S. Bureau of Labor Statistics (BLS), includes the counties of Anderson, Blount, Knox, Loudon and Union.

Economic Impact Multipliers

The Bureau of Economic Analysis (BEA) in the US Department of Commerce makes regional economic impact multipliers available through its Regional Input-Output Modeling System (RIMS II). These multipliers allow users to estimate the extent to which a change in an industry's output will affect total employment and earnings in the region. These multipliers underpin calculations of the marginal economic impacts presented in this paper.

The RIMS II multipliers used for this report are based on national interindustry or input-output relationships in 2010. These national multipliers are adjusted for regional supply conditions and trading patterns in 2010. These adjustments are necessary because local industries often do not supply all of the intermediate inputs needed to produce the region's output. Industries must purchase (import) some inputs from suppliers outside the region. Purchases of inputs from suppliers located outside the region reduce the multiplier effect on employment and earnings within the region.

The employment and earnings multipliers shown in Appendix Tables A1 and A2 are total (Type II) multipliers. These multipliers include *direct*, *indirect* and *induced* economic impacts ... Type I multipliers exclude the induced impacts. To illustrate, suppose 100 workers are hired to undertake a construction project (direct impact). Employment will increase by more than the 100 jobs directly tied to the project. As the materials and equipment needed to complete the project are purchased, additional jobs are created in the businesses that supply these materials and equipment (indirect impact). As people are put to work, directly and indirectly, they purchase more consumer goods and services. This new spending creates jobs in industries that supply consumer goods and services (induced impact).

(The following link provides additional information on the construction, use and limitations of RIMS II multipliers: http://bea.gov/regional/pdf/rims/rimsii_user_guide.pdf .)

Conceptual Model and Explanation for Industry Rankings

Conceptual Model

Conceptually, the marginal economic impact (M_x) for industry X is:

$$M_x = E_x + (J_1E_1 + J_2E_2 + \dots + J_nE_n) + \text{Induced Earnings, where}$$

E_x = average annual earnings for industry X, the direct earnings;

$J_1E_1 + J_2E_2 + \dots + J_nE_n$ are the indirect earnings, where

J = the (fractional) number of jobs in each local industry, 1 through n, supported by one job in industry X, and

E = the average annual earnings for each local industry, 1 through n.

Induced earnings are a fraction of the sum of direct and indirect earnings. This fraction is the 'final demand' earnings multiplier for households (row 62 in Tables A1 and A2) ... 0.2765 for the First Congressional District and 0.3069 for the Knoxville metro area.

Explanation for Industry Rankings

The conceptual model indicates that the magnitude of the marginal economic impact for an industry, X, is positively related to the level of average earnings in industry X and in the other industries, 1 through n, which supply inputs to industry X. The marginal impact depends also on the number, n, of local industries which supply inputs to industry X and the size of the 'J' coefficients ... these two factors are related to the jobs multiplier for an industry.

The jobs multipliers are given in Tables 1 and 2 alongside the marginal economic impacts. cursory inspection of the two measures reveals strong positive correlation. In fact, the correlation coefficient in both regions is around 90 percent. In both regions, the lowest ranked industries in terms of their marginal economic impact are service providers whose primary locally purchased input is hired labor, with average earnings at the low end of the scale. Manufacturing industries characterized by relatively high average earnings and extensive supplier linkages (numerous 'J' coefficients), and the higher-paying service industries dominate the top of the rankings.

The information presented in Tables 1 and 2 allows one to compare any two industries in terms of their relative marginal economic impacts. For example, it takes 3.1 jobs in retail trade to match the economic impact of one chemical manufacturing job in the First Congressional District ... $\$134,627/\$43,488 = 3.1$.

Empirical Model

The RIMS II multipliers, Tables A1 and A2, contain all the information needed to solve the conceptual model given above. The information is not readily apparent as it is "buried" in the output tables. What follows is a procedure to calculate the marginal economic impact for any industry listed in the RIMS II tables. Two examples will be worked to illustrate the procedure.

The first example is for the "fabricated metal product" manufacturing industry in the Knoxville metro area. The RIMS II information for the industry is given in row 11 in table A2 and is reproduced below, except for the footnotes accompanying the table.

Step 1: The "final demand" earnings multiplier is per dollar of additional output, while the final demand employment multiplier is based on jobs per million dollars of additional output (footnotes 2 and 3). To put the multipliers on the same dollar basis, the final demand earnings multiplier is multiplied by 1,000,000 ... $1,000,000 * 0.4384 = \$438,400$.

Step 2: To find the number of fabricated metal product manufacturing jobs associated with \$1,000,000 of output, divide the final demand jobs multiplier for the industry by the direct effect jobs multiplier ... $9.6381/2.0648 = 4.667813$.

Step 3: Divide the result from Step 1 by the result from Step 2 ... $\$438,400/4.667813 = \$93,918.79$. This is the marginal economic impact in 2010 dollars for the fabricated metal product manufacturing industry.

Step 4: The result in Step 3 is the marginal economic impact in 2010 dollars. The Consumer Price Index rose 6.8 percent from 2010 to 2013. The result from Step 3 is multiplied by 1.068 to put the value in 2013 dollars ... $\$93,918.79 * 1.068 = \$100,306$.

The marginal economic impact for fabricated metal product manufacturing in the Knoxville metro area is \$100,306. This means that for each additional job created in this industry, total earnings paid to households employed in all industries in the region increase by \$100,306. The marginal economic impact for each job lost in the industry is a negative \$100,306.

The direct effect jobs multiplier for the industry is 2.0648, indicating that for each job created or lost in fabricated metal product manufacturing another 1.0648 jobs are created or lost in all other sectors of the regional economy. The marginal economic impact of \$100,306 is, therefore, total earnings from 2.0648 jobs.

The second example is for “retail trade” in the First Congressional District. The RIMS II information for retail trade is found in Table A1, row 28, and is reproduced below.

Estimating the impact of a change in retail sales on earnings and employment requires special treatment. Output for retail trade is not measured by sales, but by the retail margin, that is, sales receipts less the cost of goods sold. These costs include the value of goods purchased from manufacturers and the cost of transporting these goods to retailers. There also may be a wholesale margin included in these costs. The marginal economic impact of new retail sales is considerably smaller when the products are sold, but not manufactured, in the region. In RIMS II output is taken to be the retail margin, because only the retail margin affects regional economic activity.

The average retail margin for the United States is 27-28 percent according to the U.S. Census Bureau, although the margin varies considerably from one type of retail establishment to another. Additional information on retail margins may be viewed at <http://www.census.gov/retail>.

The marginal economic impact for retail trade is calculated by the four -step procedure used earlier (see the earlier example for explanations of the calculations). It should be mentioned that the \$1,000,000 in Step 1 below is the retail margin, not sales.

Step 1: $\$1,000,000 * 0.5006 = \$500,600$.

Step 2: $17.0836/1.3896 = 12.2939$.

Step 3: $\$500,600/12.2939 = \$40,719.39$

Step 4: $\$40,719.39*1.068 = \$43,488.$

The marginal economic impact for retail sales in the First Congressional District is \$43,488. This means that for each additional job created in this industry, total earnings paid to households employed in all industries in the region increase by \$43,488. The marginal economic impact for each job lost in the industry is a negative \$43,488.

The direct effect jobs multiplier for retail trade is 1.3896, indicating that for each job created or lost in the retail trade industry another 0.3896 jobs are created or lost in all other sectors of the regional economy. The marginal economic impact of \$43,488 is, therefore, total earnings from 1.3896 jobs.

To extend this example, suppose a new sporting goods store is coming to the region. Annual sales of \$30 million are expected. The goods are manufactured outside the region and the shipping costs are paid to firms located outside the region. The average retail margin for the store is 40 percent. What effect will this new store have on income and employment in the region?

A store with \$30 million in sales and a retail margin of 40 percent generates a margin of \$12 million. Earnings paid to households employed in all industries in the region increase by \$6,007,200 ... $\$12,000,000*0.5006.$

The final demand jobs multiplier for retail trade in the region is 17.0836 jobs per one \$1 million of output (retail margin). Footnote 3 to Tables A1 and A2 states that output should be in 2010 dollars. The \$12 million retail margin in the example is \$11.236 million in 2010 dollars ... $\$12 \text{ mil.}/1.068.$ The increase in jobs in all industries in the region is therefore 192 jobs ... $11.236*17.0836.$

	Multiplier					
	Final Demand				Direct Effect	
Table A2. Knoxville Metro Area	Output (dollars)	Earnings (dollars)	Employment (jobs)	Value-added (dollars)	Earnings (dollars)	Employment (jobs)
11. Fabricated metal product mfg.	1.7362	0.4384	9.6381	0.8454	1.7973	2.0648
Table A1. First Congressional District						
28. Retail trade	1.6255	0.5006	17.0836	1.0304	1.5159	1.3896

Conclusions

Tables 1 and 2 present the marginal economic impact for industries with 1,000 or more employees in the First Congressional District and the Knoxville metro area. In both regions, the lowest ranked industries in terms of their marginal economic impact are service providers whose primary locally purchased input is hired labor, with average earnings at the low end of the scale. Manufacturing industries characterized by

relatively high average earnings and extensive supplier linkages, and the higher-paying service industries dominate the top of the rankings.

Specific industries with the largest impacts include chemical, paper, machinery, food and fabricated metal product manufacturing, utilities, ambulatory health care, broadcasting, management of companies and enterprises, telecommunications, wholesale trade and banking services. Specific industries that ranked lowest in terms of marginal economic impact include retail trade, food services and drinking places, social assistance, amusements and recreation, nursing and residential care facilities, educational services and administrative and support services.

Table 1. First Congressional District	<i>Marginal Impact</i> ¹	<i>Jobs</i>
	<i>Multiplier</i> ²	
Row Industry / Industry Aggregation:	Dollars	Multiplier
Paper manufacturing	139,729	2.5873
Chemical manufacturing	134,627	2.2864
Utilities (includes government enterprises)	130,628	2.0975
Management of companies and enterprises	116,413	1.9257
Food, beverage, and tobacco product mfg.	111,428	2.5853
Machinery manufacturing	107,056	2.0628
Ambulatory health care services	98,049	1.7749
Wholesale trade	96,055	1.8748
Electrical equipment and appliance manufacturing	95,837	2.0264
Federal Reserve banks, credit intermediation and related services	95,243	2.1033
Fabricated metal product manufacturing	94,667	1.9563
Telecommunications	93,649	2.0571
Plastics and rubber products manufacturing	93,015	2.0176
Nonmetallic mineral product manufacturing	89,443	1.9942
Furniture and related product manufacturing	84,123	1.8036
Professional, scientific, and technical services	83,520	1.6466
Hospitals	81,232	1.7238
Printing and related support activities	77,393	1.8687
Other transportation equipment manufacturing	76,355	1.9626
Primary metal manufacturing	75,995	1.9499
Truck transportation	75,364	1.801
Wood product manufacturing	68,005	1.8081
Construction	67,225	1.6259
Warehousing and storage	53,359	1.4373
Accommodation	50,242	1.5698
Nursing and residential care facilities	46,286	1.3702
Retail trade	43,488	1.3896
Educational services	42,262	1.336
Real estate	40,557	1.6662
Administrative and support services	39,794	1.322
Food services and drinking places	29,669	1.2861
Social assistance	27,506	1.2302
Amusements and recreation	21,789	1.1924

Note: Footnotes are placed at the end of Table 2.

Table 2. Knoxville Metro Area	<i>Marginal Impact</i> ¹	<i>Jobs Multiplier</i> ²
Row Industry / Industry Aggregation:	Dollars	Multiplier
Chemical manufacturing	173,873	3.0935
Utilities (includes government enterprises)	139,390	2.2844
Management of companies and enterprises	126,159	2.1219
Waste management and remediation services	124,343	2.5050
Machinery manufacturing	117,891	2.2774
Broadcasting, except Internet	117,687	2.1882
Telecommunications	116,578	2.5231
Food, beverage, and tobacco product manufacturing	116,080	2.5816
Miscellaneous manufacturing	114,016	1.9679
Federal Reserve banks, credit intermediation and related services	110,371	2.4017
Wholesale trade	108,595	2.1349
Ambulatory health care services	104,512	1.9163
Computer and electronic product manufacturing	101,302	2.0979
Insurance carriers and related activities	101,131	2.0593
Fabricated metal product manufacturing	100,306	2.0648
Plastics and rubber products manufacturing	98,009	2.1223
Professional, scientific, and technical services	93,233	1.8653
Hospitals	89,313	1.9034
Primary metal manufacturing	88,424	2.2267
Truck transportation	86,683	2.0598
Transportation equipment manufacturing	76,267	1.9382
Construction	73,831	1.7618
Warehousing and storage	57,708	1.5366
Accommodation	57,024	1.6993
Nursing and residential care facilities	49,760	1.4467
Real estate	48,087	1.8283
Retail trade	47,217	1.4699
Educational services	45,207	1.4019
Administrative and support services	45,105	1.4435
Food services and drinking places	31,674	1.3232
Social assistance	29,118	1.2654
Amusements and recreation	23,205	1.2159

¹ Increase (decrease) in total annual earnings paid to households employed in all industries for each job created (lost) in the row industry / industry aggregation, 2013 dollars ... author's calculation.

² Increase (decrease) in the number of jobs in all industries for each job created (lost) in the row industry/industry aggregation ... see footnote 6 to Tables A1 and A2.

APPENDIX

Total Multipliers (Type II) for Output, Earnings, Employment and Value Added by
Industry and Industry Aggregation

Table A1: First Congressional District

Table A2: Knoxville Metro Area

Table A1. First Congressional District	Multiplier					
	Final Demand				Direct Effect	
	Output/1/ (dollars)	Earnings/2/ (dollars)	Employment/3/ (jobs)	Value-added/4/ (dollars)	Earnings/5/ (dollars)	Employment/6/ (jobs)
1. Crop and animal production	1.6276	0.3978	12.9629	0.7450	1.6997	1.5585
2. Forestry, fishing, and related activities	1.5643	0.5430	21.3638	0.9343	1.4096	1.2756
3. Oil and gas extraction	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4. Mining, except oil and gas	1.3572	0.2472	5.8490	0.7892	1.6502	1.7284
5. Support activities for mining	1.6549	0.4627	11.1741	0.7863	1.6292	1.7211
6. Utilities*	1.3093	0.2712	4.6508	0.8739	1.4760	2.0975
7. Construction	1.8003	0.6078	15.6999	0.9734	1.5646	1.6259
8. Wood product manufacturing	1.8421	0.5046	14.3285	0.7874	1.8574	1.8081
9. Nonmetallic mineral product manufacturing	1.7417	0.4133	9.8414	0.8039	1.8871	1.9942
10. Primary metal manufacturing	1.6065	0.2895	7.9332	0.5079	2.0961	1.9499
11. Fabricated metal product manufacturing	1.6868	0.4360	9.6226	0.8012	1.6964	1.9563
12. Machinery manufacturing	1.6159	0.3904	8.0339	0.7827	1.6969	2.0628
13. Computer and electronic product manufacturing	1.3436	0.2574	5.7057	0.9104	1.5535	1.6988
14. Electrical equipment and appliance manufacturing	1.5683	0.3265	7.3730	0.6918	1.8254	2.0264
15. Motor vehicle, body, trailer, and parts manufacturing	1.7919	0.3471	9.2653	0.5446	2.3762	2.1725
16. Other transportation equipment manufacturing	1.6491	0.3183	8.7378	0.6488	2.0943	1.9626
17. Furniture and related product manufacturing	1.7079	0.4848	11.1009	0.8835	1.6267	1.8036
18. Miscellaneous manufacturing	1.6100	0.4562	8.4743	0.9183	1.5593	2.0252
19. Food, beverage, and tobacco product manufacturing	1.8542	0.3672	9.0989	0.6798	2.3811	2.5853
20. Textile and textile product mills	1.9099	0.4324	10.5153	0.7665	2.1334	2.1224
21. Apparel, leather, and allied product manufacturing	1.6496	0.5877	18.9417	1.0261	1.4510	1.3723
22. Paper manufacturing	1.6654	0.3441	6.8048	0.6861	1.9850	2.5873
23. Printing and related support activities	1.8166	0.4584	11.8210	0.8036	1.8760	1.8687
24. Petroleum and coal products manufacturing	1.2350	0.2204	3.7897	0.4030	1.4100	1.8466
25. Chemical manufacturing	1.6257	0.3845	6.9741	0.6972	1.7350	2.2864
26. Plastics and rubber products manufacturing	1.6931	0.3716	8.6085	0.7378	1.9201	2.0176
27. Wholesale trade	1.5696	0.4613	9.6159	0.9876	1.5438	1.8748
28. Retail trade	1.6255	0.5006	17.0836	1.0304	1.5159	1.3896
29. Air transportation	1.4334	0.3096	8.2291	0.6848	1.7084	1.8750
30. Rail transportation	1.5766	0.3537	6.9413	0.7544	1.8558	2.6919
31. Water transportation	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32. Truck transportation	1.6673	0.4791	12.2278	0.8502	1.6893	1.8010
33. Transit and ground passenger transportation*	1.6462	0.6690	19.8818	1.0792	1.3580	1.3376
34. Pipeline transportation	1.7755	0.7004	11.6993	1.0699	1.4735	2.1667
35. Other transportation and support activities*	1.6262	0.6276	15.0657	1.0671	1.3960	1.5203
36. Warehousing and storage	1.6305	0.5820	16.7430	1.1114	1.4366	1.4373
37. Publishing industries, except Internet	1.6709	0.4992	12.6030	0.8592	1.5919	1.6812
38. Motion picture and sound recording industries	1.8188	0.3383	8.9070	1.0474	2.4274	2.6069

Table A1. First Congressional District	Multiplier					
	Final Demand				Direct Effect	
	Output/1/ (dollars)	Earnings/2/ (dollars)	Employment/3/ (jobs)	Value-added/4/ (dollars)	Earnings/5/ (dollars)	Employment/6/ (jobs)
39. Broadcasting, except Internet	1.7685	0.4850	9.8783	0.7848	1.8000	2.3124
40. Telecommunications	1.4567	0.2593	6.0831	0.8390	1.8132	2.0571
41. Internet and other information services	1.5878	0.3354	8.0162	0.8273	1.9300	2.2917
42. Federal Reserve banks, credit intermediation and related services	1.5228	0.3131	7.3845	0.8754	1.7966	2.1033
43. Securities, commodity contracts, investments	1.6958	0.4840	12.6727	0.7726	1.6244	1.6897
44. Insurance carriers and related activities	1.5277	0.4668	10.1213	0.9688	1.4735	1.6927
45. Funds, trusts, and other financial vehicles	1.3668	0.2478	14.8579	0.6242	1.6236	1.2106
46. Real estate	1.3847	0.1392	6.1046	0.9185	2.9213	1.6662
47. Rental and leasing services and lessors of intangible assets	1.3819	0.3088	5.8417	0.9591	1.5127	1.9944
48. Professional, scientific, and technical services	1.7000	0.6862	14.4484	1.1332	1.3959	1.6466
49. Management of companies and enterprises	1.7218	0.6593	11.6477	1.0796	1.4304	1.9257
50. Administrative and support services	1.6807	0.6425	22.7958	1.0773	1.4185	1.3220
51. Waste management and remediation services	1.6116	0.4401	9.3928	0.8723	1.6436	2.0294
52. Educational services	1.7719	0.6855	23.1437	1.1129	1.4179	1.3360
53. Ambulatory health care services	1.7509	0.7110	13.7459	1.1365	1.4269	1.7749
54. Hospitals	1.7320	0.5803	13.1517	0.9744	1.5101	1.7238
55. Nursing and residential care facilities	1.7105	0.6553	20.7180	1.0972	1.4150	1.3702
56. Social assistance	1.7126	0.6304	30.1115	1.0615	1.4444	1.2302
57. Performing arts, spectator sports, museums, zoos, and parks	1.7077	0.6262	21.1436	1.0209	1.4688	1.3846
58. Amusements, gambling, and recreation	1.5792	0.4741	27.7094	0.9883	1.5028	1.1924
59. Accommodation	1.6684	0.4360	14.5491	0.9331	1.7654	1.5698
60. Food services and drinking places	1.6903	0.4809	22.2635	0.9286	1.6065	1.2861
61. Other services*	1.7823	0.6052	17.1499	1.0158	1.5489	1.5408
62. Households	0.9983	0.2765	8.1733	0.6019	0.0000	0.0000

First Congressional District: Carter, Cocke, Greene, Hamblen, Hancock, Hawkins, Johnson, Sullivan, Unicoi, Washington and parts of Jefferson and Sevier counties.

*Includes Government enterprises.

1. Each entry in column 1 represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
2. Each entry in column 2 represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
3. Each entry in column 3 represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Because the employment multipliers are based on 2010 data, the output delivered to final demand should be in 2010 dollars.
4. Each entry in column 4 represents the total dollar change in value added that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
5. Each entry in column 5 represents the total dollar change in earnings of households employed by all industries for each additional dollar of earnings paid directly to households employed by the industry corresponding to the entry.
6. Each entry in column 6 represents the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry.

Multipliers are based on the 2010 Annual Input-Output Table for the Nation and 2010 regional data.

SOURCE.--Regional Input-Output Modeling System (RIMS II), Regional Product Division, Bureau of Economic Analysis

Table A2. Knoxville Metro Area	Multiplier					
	Final Demand				Direct Effect	
	Output/1/ (dollars)	Earnings/2/ (dollars)	Employment/3/ (jobs)	Value-added/4/ (dollars)	Earnings/5/ (dollars)	Employment/6/ (jobs)
1. Crop and animal production	1.6490	0.4622	15.0646	0.7793	1.6060	1.4728
2. Forestry, fishing, and related activities	1.8279	0.3965	15.2825	1.1314	1.6849	1.4937
3. Oil and gas extraction	1.4881	0.2976	6.2517	0.9266	1.9040	2.2378
4. Mining, except oil and gas	1.4644	0.2503	5.9172	0.8474	1.9612	2.0519
5. Support activities for mining	2.1095	0.5703	13.4549	1.0582	2.2381	2.3097
6. Utilities*	1.3569	0.2738	4.7923	0.9079	1.5749	2.2844
7. Construction	1.8858	0.5912	15.0669	1.0471	1.7185	1.7618
8. Wood product manufacturing	1.7868	0.5393	15.1577	0.7926	1.6402	1.5802
9. Nonmetallic mineral product manufacturing	1.8158	0.4227	10.0282	0.8586	2.0723	2.1818
10. Primary metal manufacturing	1.8257	0.3395	9.1307	0.6094	2.4382	2.2267
11. Fabricated metal product mfg.	1.7362	0.4384	9.6381	0.8454	1.7973	2.0648
12. Machinery manufacturing	1.7352	0.4219	8.7044	0.8667	1.8687	2.2774
13. Computer and electronic product manufacturing	1.5632	0.3419	7.5620	1.0474	1.9229	2.0979
14. Electrical equipment and appliance manufacturing	1.7021	0.3640	8.1253	0.7973	2.1495	2.3587
15. Motor vehicle, body, trailer, and parts manufacturing	1.9333	0.3701	9.5591	0.6374	2.8971	2.5629
16. Other transportation equipment manufacturing	1.6681	0.3397	9.2199	0.6801	2.0923	1.9382
17. Furniture and related product manufacturing	1.7043	0.4301	9.8551	0.9059	1.7908	1.9869
18. Miscellaneous manufacturing	1.6292	0.4973	9.1670	0.9520	1.5271	1.9679
19. Food, beverage, and tobacco product manufacturing	1.7648	0.3400	8.0757	0.6837	2.4804	2.5816
20. Textile and textile product mills	1.7046	0.3865	9.5306	0.7150	1.9612	1.9788
21. Apparel, leather, and allied product manufacturing	1.6028	0.5106	16.2097	1.0109	1.4915	1.3894
22. Paper manufacturing	1.8669	0.3779	7.5247	0.8045	2.3818	3.1258
23. Printing and related support activities	1.9033	0.4906	12.5461	0.8890	2.0096	1.9853
24. Petroleum and coal products manufacturing	1.2836	0.2338	4.0807	0.4363	1.4960	1.9884
25. Chemical manufacturing	1.6394	0.3127	5.9418	0.7220	2.2409	3.0935
26. Plastics and rubber products manufacturing	1.6848	0.3449	7.9764	0.7525	2.0231	2.1223
27. Wholesale trade	1.7473	0.5070	10.6450	1.1090	1.7454	2.1349
28. Retail trade	1.7513	0.5258	17.4816	1.1198	1.6462	1.4699
29. Air transportation	1.4892	0.3277	8.5689	0.7256	1.7428	1.8819
30. Rail transportation	1.7615	0.3752	7.5283	0.8711	2.2707	3.3671
31. Water transportation	1.4676	0.2896	6.0230	0.6924	1.8525	2.3775
32. Truck transportation	1.7985	0.4726	11.9938	0.9426	1.9429	2.0598
33. Transit and ground passenger transportation*	1.7498	0.6835	20.0524	1.1532	1.4289	1.3894
34. Pipeline transportation	1.7262	0.5257	9.2626	1.0550	1.6677	2.5868
35. Other transportation and support activities*	1.6835	0.5790	13.8550	1.1126	1.4994	1.6276
36. Warehousing and storage	1.7372	0.5744	16.3346	1.1873	1.5536	1.5366
37. Publishing industries, except Internet	1.7644	0.5404	13.5683	0.9387	1.6739	1.7581
38. Motion picture and sound recording industries	1.6695	0.4431	11.3259	0.9838	1.7412	1.8154
39. Broadcasting, except Internet	1.9459	0.6468	12.8440	0.9200	1.7472	2.1882

Table A2. Knoxville Metro Area	Multiplier					
	Industry	Final Demand			Direct Effect	
		Output/1/ (dollars)	Earnings/2/ (dollars)	Employment/3/ (jobs)	Value-added/4/ (dollars)	Earnings/5/ (dollars)
40. Telecommunications	1.6292	0.3076	7.1101	0.9444	2.2575	2.5231
41. Internet and other information services	1.7383	0.3664	8.7095	0.9334	2.3486	2.7735
42. Federal Reserve banks, credit intermediation and related services	1.7201	0.3798	8.8265	1.0047	2.0820	2.4017
43. Securities, commodity contracts, investments	1.9750	0.5630	14.4602	0.9557	1.9191	1.9583
44. Insurance carriers and related activities	1.8107	0.5203	11.3152	1.1552	1.7874	2.0593
45. Funds, trusts, and other financial vehicles	1.5123	0.2873	15.6582	0.7091	1.9115	1.2958
46. Real estate	1.5018	0.1726	7.0086	0.9964	3.4618	1.8283
47. Rental and leasing services and lessors of intangible assets	1.6053	0.3989	7.7410	1.1028	1.7431	2.3573
48. Professional, scientific, and technical services	1.8345	0.6620	14.1452	1.2306	1.5580	1.8653
49. Management of companies and enterprises	1.9022	0.7145	12.8345	1.2030	1.5502	2.1219
50. Administrative and support services	1.8006	0.6025	20.5931	1.1638	1.6077	1.4435
51. Waste management and remediation services	1.8705	0.4827	10.3857	1.0335	2.0125	2.5050
52. Educational services	1.8837	0.6879	22.7830	1.1976	1.5169	1.4019
53. Ambulatory health care services	1.8934	0.7413	14.5165	1.2398	1.5208	1.9163
54. Hospitals	1.9033	0.6118	13.9251	1.0967	1.6604	1.9034
55. Nursing and residential care facilities	1.8247	0.6564	20.3815	1.1836	1.5214	1.4467
56. Social assistance	1.8780	0.6925	32.1413	1.1770	1.5289	1.2654
57. Performing arts, spectator sports, museums, zoos, and parks	1.8298	0.5169	16.6476	1.1095	1.8210	1.6375
58. Amusements, gambling, and recreation	1.8526	0.6048	33.8457	1.1592	1.6004	1.2159
59. Accommodation	1.8115	0.4687	14.9169	1.0347	2.0039	1.6993
60. Food services and drinking places	1.7803	0.5057	22.5625	1.0052	1.7151	1.3232
61. Other services*	1.9272	0.6252	17.4863	1.1185	1.6936	1.6626
62. Households	1.1165	0.3069	8.8381	0.6890	0.0000	0.0000

Knoxville Metro Area: Anderson, Blount, Knox, Loudon and Union counties.

*Includes Government enterprises.

1. Each entry in column 1 represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
2. Each entry in column 2 represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
3. Each entry in column 3 represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Because the employment multipliers are based on 2010 data, the output delivered to final demand should be in 2010 dollars.
4. Each entry in column 4 represents the total dollar change in value added that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.
5. Each entry in column 5 represents the total dollar change in earnings of households employed by all industries for each additional dollar of earnings paid directly to households employed by the industry corresponding to the entry.
6. Each entry in column 6 represents the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry.

Multipliers are based on the 2010 Annual Input-Output Table for the Nation and 2010 regional data.

SOURCE.--Regional Input-Output Modeling System (RIMS II), Regional Product Division, Bureau of Economic Analysis.