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A Comparison of Alternative Methods for Generating Economic Base Multipliers

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Introduction

Nearly a decade has passed since the last round of empirical investigations examining the accuracy of alternative methods for estimating economic base multipliers. Gibson and Worden [2] compared survey-based multipliers for twenty Arizona communities with multipliers calculated using location quotients (LQ) based on two-digit Standard Industrial Classification (SIC) Code data and Moore's [5] minimum requirements (MR) regression formula. They found that the LQ approach gave completely unsuitable results, producing multipliers that were two to three times the size of survey multipliers adjusted for wage differences, transfer payments, and commuting. On the other hand, the MR multipliers calculated using Moore's simple equation, requiring only a single input variable (i.e., local population), produced multipliers for 16 of 20 communities that came within 15 percent of the adjusted survey-based multipliers. They concluded that for impact studies under budget and time constraints not permitting the census survey approach, the Moore equation should be used.

Working with a larger sample of 101 metropolitan areas, Isserman [3] examined the variations in export share (inverse of the economic base multiplier) generated using alternative estimation procedures. Theory suggests that the LQ method tends to underestimate the export base, implying that any method which generates lower estimates than the LQ should not be used. Isserman also used the Moore equation but implemented the LQ method using four-digit level data from the Census Bureau's *County Business Patterns* file augmented by Bureau of Economic Analysis (BEA) data on farm and government employment. In addition, all federal employment and hotel, motel, and tourist court employment were assigned to the export sector.

Isserman found that in 22 out of 101 cases the MR technique yielded smaller estimates of the export base (larger multipliers) than the LQ technique. He attributed this result to the Moore equation's univariate relationship between multiplier size and population while ignoring other important factors such as industrial composition and export orientation. In light of this finding, Isserman recommended that

practitioners should avoid use of the MR technique for regions with highly specialized economies (e.g., Washington, E.C., Detroit, Las Vegas).

Since these two studies were published, the minimum requirements equation has been updated using data from the 1980 Census (Moore and Jacobsen [6]). Moreover, further improvements to the location quotient method have been made (Bloomquist, Robinson, and Webster [1]). The purpose of this research is to reexamine the conclusions reached by Gibson and Worden [2] and Isserman [3] in light of these new developments. Specifically, this paper compares economic base multipliers estimated using the MR and LQ techniques for three separate samples: (1) 315 Metropolitan Statistical Areas (MSAs), (2) individual counties in the states of Illinois and Missouri, and (3) the original 20 Arizona communities and their associated counties in the Gibson and Worden [2] study.

Estimation Techniques

Two methods in widespread use for estimating economic base multipliers are selected for comparison. The first method is the updated version of the MR equation, from Moore and Jacobsen [6]. The second technique is an LQ-based procedure developed by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory (CERL) and used in CERL's Economic Impact Forecast System (EIFS) (Robinson et al.[7]).

Minimum Requirements

The MR technique was first proposed by Ullman and Dacey [8], expanded by Ullman, Dacey, and Brodsky [9], and applied to the problem of estimating economic base multipliers by Moore [5]. In Moore and Jacobsen [6] the MR equation was updated using 1980 data.

The goal of the MR approach is to estimate the average propensity to consume locally produced goods and services (c). When the value of c is known, the economic base multiplier can be calculated using the well-known relationship

$$M = \frac{1}{1 - c} \qquad (1)$$

Beginning with Ullman and Dacey [8] and in the subsequent studies cited above, c has been estimated as a log-linear function of community population. In the latest version of the MR equation [6], the following specification is used:

$$c = (-30.40311 + 15.58022(Log_{10}POP)) / 100 \qquad (2)$$

For example, if there are 120,000 persons living in a community, the average propensity to consume locally is calculated as

$$c = (-30.40331 + 15.58022\ (5.07918)) / 100$$

$$= 0.49$$

The economic base multiplier is calculated as

$$M = \frac{1}{1 - 0.49} = 1.96$$

A detailed explanation of the estimation procedure used in developing equation (2) is found in Moore and Jacobsen [6]. It is not the aim of this article to critically review the theoretical or computational merits of the MR method, however, two points deserve brief mention. First, equation (2) was estimated using only "free-standing" (i.e., mono-centered) SMSAs and non-specialized economies. That is, cities with an obvious export orientation, such as Las Vegas, Washington, D.C., and Detroit, were excluded. The practice of excluding "outliers" may be understandable from the point of view of equation estimation but leaves the impact analyst who must deal with these "unique cases" (and which region isn't in some way unique?) bereft of an appropriate multiplier estimation technique.

Second, proponents of the MR approach claim that it estimates an income multiplier, however, the estimation procedure relies exclusively on employment data from the decennial census. No adjustment is made for regional wage differences or variations in productivity among industrial sectors. Again, this is not a major criticism, but it does perhaps suggest that multipliers generated using the MR methods are best termed employment, not income multipliers.

Multiplier Estimation in CERL's Economic Impact Forecast System (EIFS)

The EIFS program generates economic base multipliers using a modified LQ procedure. The LQ is mathematically defined as

$$LQ_{ir} = \frac{E_{ir} / E_{\bullet r}}{E_{i\bullet} / E_{\bullet\bullet}} \qquad (3)$$

where LQ_{ir} is the location quotient for industry i in region r, E_{ir} is regional employment for industry i, $E_{\bullet r}$ is total regional employment, $E_{i\bullet}$ is national employment for industry i, and $E_{\bullet\bullet}$ is total national total employment.

The export activity (X_{ir}) of regional employment in industry i (E_{ir}), if its location quotient (LQ_{ir}) is greater than one, is calculated as

$$X_{ir} = \{ 1 - \frac{1}{LQ_{ir}} \} E_{ir} \qquad (4)$$

The economic base multiplier is calculated by estimating export employment using equation (4) for all industries with LQs greater than one, summing the export employment of all those industries, and dividing the sum into total employment. Since these calculations traditionally have been done by hand, most previous applications have used highly aggregated (e.g., 2-digit SIC) data. However, as Isserman [4] points out, this practice exacerbates the tendency of the LQ approach to underestimate export activity, thereby inflating multiplier values.

In order to correct for some of the known theoretical deficiencies of the LQ method the following modifications have been implemented in the EIFS multiplier estimation procedure:

1. Four-digit SIC data from the Census Bureau's *County Business Pattern*'s "published and unpublished" data file are used to calculate the multipliers. This file provides greater industrial detail than the "published" CBP file, especially in rural areas. This file is available from the National Planning Data Corporation (NPDC) and contains a count of firms, employment, and earnings for all 4-digit industries and 3,200 counties in the nation. Separate calculations are made to estimate employment and

income multipliers using CBP employment and earnings data. An estimation technique developed by NPDC is used to "fill in" the undisclosed cells. Earnings estimates use local data when disclosed, otherwise state-level data are used.

2. Bureau of Economic Analysis (BEA) division-level data is used to supplement the CBP data for missing sectors, notably government and agriculture. Also, BEA farm income data is used to disaggregate the farm employment data. This allows for the identification of additional export-related activity in the agriculture sector.

3. A modification to the LQ method originally proposed by Isserman [4] is to assign all federal government employment (both military and civilian) and hotel, tourist court, and motel employment to the export sector. The rationale for this adjustment is that such activities generate income for the region similar to exports and that hotel and related industries, in particular, are not oriented to serving local needs.

4. Since the CBP data are collected for one point in time (third week in March), they do not represent an average annual employment estimate. Therefore, a fourth modification to the LQ multiplier estimation procedure is the adjustment of the CBP data for seasonal variation. To accomplish this, the CBP data are adjusted to BEA division-level total employment or income prior to carrying out the multiplier calculations.

The EIFS program is both a database and modeling system that is available for public use via mainframe computer at the University of Illinois, Urbana-Champaign. User log-ins are available through the Department of Urban and Regional Planning's Environmental Technical Information System (ETIS) Center. Users interested in finding out more about EIFS should contact the ETIS Center at (217) 333-1369.

Comparison of Results

In this section several tables are presented comparing economic base multipliers generated using the updated MR method (equation 2) and the EIFS modified LQ-based procedure described above. The intent is to evaluate the relative performance of these two methods in light of the recent changes in data and estimation techniques used.

Approach

Multipliers were calculated for three different sets of study areas: 315 metropolitan areas, all counties in the states of Illinois and Missouri, and the 20 Arizona communities in the Gibson and Worden [2] study. In the first set of 315 cities, no attempt was made to isolate "free-standing" cities from other areas -- the areas selected essentially represent all MSAs (Metropolitan Statistical Areas), PMSAs (Primary Metropolitan Statistical Areas), and NECMAs (New England County Metropolitan Areas) as defined in the 1987 *Statistical Abstract of the United States* (Appendix II). The decision not to use only "free-standing" areas as others have done [3, 9] is simply that practitioners who use these techniques do not live only in "free-standing" communities. Planners who rely on economic base analysis to evaluate policies that affect their communities should be given all the information available to make intelligent decisions concerning the choice of multiplier estimation technique.

A second set of comparisons is made for all counties in the states of Illinois and Missouri. This choice primarily reflects the parochial interests of a member of the Mid-Continent Regional Science Association, although one could argue that since both states represent a cross-section of urban and rural communities of widely varying size, such a sample should provide a useful test of the generality of the two techniques.

Finally, multipliers are generated for the 12 Arizona counties and 20 communities in the Gibson and Worden [2] study. Since this work remains the only attempt to date to compare multipliers estimated using both survey and non-survey techniques, it was felt that such a comparison would be of interest.

The EIFS LQ method was implemented using earnings estimates from the 1982 *Enhanced County Business Patterns* data file purchased from the National Planning Data Corporation. This file was augmented with BEA division-level wage and salary and proprietors' income data for 1982 with the modifications described. The MR method (equation 2) was implemented using 1980 population data, except as noted.

Results

Simple ratios are used to compare multipliers generated using the MR and LQ techniques. Ratios greater than 1.0 occur when the value of

the LQ multiplier exceeds the MR multiplier and vice versa for ratios less than 1.0.

Metropolitan Statistical Areas (MSAs)

Table 1 displays the multiplier ratios for 315 Metropolitan Statistical Areas (MSAs). A complete listing of MSA multipliers is found in Appendix I

The results support Isserman's [3] finding that in a significant number of cases, the MR technique produces larger multipliers (identifies a smaller fraction of the export base) than the LQ technique. This occurred in 94 out of 315 MSAs in the present study. Examining the results classified by largest sector within each MSA (Table 1), cities specialized in government (including federal, civilian, military, and state and local government) and manufacturing accounted for the majority of instances where MR multipliers exceeded LQ multipliers. This follows from the modified LQ technique's assignment of all federal activity to the export sector and the ability of the LQ method to account for structural differences among cities. In contrast, the MR technique assumes multiplier size depends only on population.

Casual observation of both sets of multipliers reveals a close match. Minneapolis has the largest LQ multiplier of 4.48 while New York's MR multiplier is 4.42. In addition, 169 out of 315 (54 percent) of the LQ multipliers were within 10 percent of the corresponding MR values and 270 out of 315 (86 percent) were within 20 percent. The mean ratio of 1.06 indicates that, on average, LQ-based multipliers are only 6 percent higher than corresponding MR-based multipliers.

Statistical analysis of both sets of multipliers using a matched pairs test (i.e., examining the differences between LQ and MR multipliers for each MSA) indicates a significant difference between the two sets of multipliers at the .01 level. In other words, the MR method consistently generates multipliers that are smaller in value than the LQ method. The mean absolute difference in multiplier values generated by the two methods is 0.26.

To obtain a better understanding of why multipliers vary significantly for some cities using different estimation techniques, the 45 MSAs with the largest and smallest frequency ratios are shown in Table 2. Cities with ratios equal to or greater than 1.20 may be characterized as having a more diverse economy than would otherwise be expected for cities of

similar size. Thirty-six of the 45 cities are in this category. The sample represents cities from all geographic regions of the nation and ranging in size from Bismarck, ND to Saint Louis, MO. Oil patch cities (e.g., Tulsa, OK; Dallas, TX) are overrepresented, suggesting that perhaps the severe economic recession which occurred during the early 1980's may be artificially inflating the non-basic/basic ratio in the LQ method. The appearance of cities such as Peoria, IL and Akron, OH, traditionally perceived as being strongly export-oriented, seems to confirm this suspicion.

Cities having multiplier ratios equal to or less than 0.8 would tend to indicate extreme specialization. Indeed, a brief glance at the nine entries at the bottom of Table 2 seems to confirm the commonly-held perceptions of these cities (i.e., Gary, IN - steel; Flint, MI - automobiles; Washington, D.C. - government). One somewhat surprising exception is New York City.

New York's ratio is only slightly larger than that for Washington, D.C., indicating that despite its large population and diverse economy, New York is also quite specialized in industries such as financial services, trade, entertainment, etc. This observation confirms a similar finding by Isserman [3].

Illinois and Missouri Counties

A surprising result of the study is the extremely close match between the MR and LQ methods for Illinois and Missouri county multipliers. It was felt that since the Moore and Jacobsen equation was calibrated using MSA data, the MR technique would diverge more sharply from the LQ method when applied to non-MSA study areas. In fact, the opposite was true.

Table 3 displays the frequency ratios for counties in the states of Illinois and Missouri. The actual county multiplier values are found in Appendix II and III. This table shows that 86 out of 102 LQ multipliers for Illinois counties (84 percent) and 88 out of 115 LQ multipliers for Missouri counties (77 percent) were within 10 percent of the MR multiplier value. The mean multiplier ratio was also smaller than for MSAs -- on average the LQ county multiplier was only two percent and three percent larger than the MR county multiplier for Illinois and Missouri, respectively.

The three counties with the largest frequency ratios were Du Page and Peoria Counties in Illinois and Clay County, Missouri. Again, the

appearance of Peoria may be related to negative economic events (i.e., recession) that were occurring during 1982. However, Du Page County, a suburb of Chicago, and Clay County, a Kansas City suburb, are both wealthy and fast-growing areas. This may indicate that the LQ is equally sensitive to -- and produces larger multipliers for -- both fast growing and declining areas.

Separate tests of significance were conducted for Illinois and Missouri counties. In both cases the null hypothesis was that MR multipliers were not smaller than LQ multipliers. Again, a matched pairs test and .01 level of significance was used. For Illinois counties, the null hypothesis was not rejected (t value = 2.317). In other words, there is no significant difference between multipliers generated by the two methods. On the other hand, the null hypothesis was rejected for Missouri counties (t value = 3.677), indicating that multipliers generated using the two techniques are significantly different.

Arizona Towns

In their study, Gibson and Worden found the LQ approach to produce multipliers that were typically two to three times larger than multipliers produced by any other technique. In contrast, the present study finds that the LQ method to generate multipliers that compare favorably with Gibson and Worden's fully adjusted (K_5) survey-based multipliers and those estimated using the MR technique (Table 4).

While LQ multipliers could not be estimated for individual towns due to lack of disaggregated income or employment data at the sub-county level, two interesting observations about the multipliers in Table 4 can be made. First, in 13 out of 20 cases, the MR multipliers are actually smaller than the fully-adjusted (K_5) survey multipliers. This is strong empirical evidence supporting the theoretical belief that the MR approach overcounts the number of local firms engaged in export activity. On the other hand, none of the LQ multipliers is smaller than the survey multipliers. (Composite multipliers for counties with more than one community represented are shown in parentheses. These were calculated by weighting the K_5 multipliers by community population.) In fact, in 6 out of 12 cases the county LQ multipliers are within 15 percent of the survey multiplier values. Second, in Greenlee County, where the surveyed community comprises a significant portion of the population base of the county, the LQ multiplier is actually closer in value to the K_5 survey multiplier than the MR multiplier. This may indicate the ability of the modified LQ method to account for important regional factors, such

as wage differences, when implemented using the data sources described previously.

Summary

This paper reports on an empirical investigation of the comparability of economic base multipliers generated using location quotients and the minimum requirements approach. In general, multipliers produced using a modified LQ method compare more favorably than previously reported in an earlier study by Gibson and Worden. The specific modifications to the LQ technique include:

1. Use 4-digit SIC earnings estimates from the *Enhanced County Business Patterns* file.

2. Supplement the CBP data with BEA division-level personal income data for government and agriculture. Disaggregate BEA farm personal income using BEA farm income and expenditures data.

3. Assign all federal government military and civilian earnings and hotel, motel, and tourist court earnings to the export sector.

4. Annualize the CBP data using division-level BEA data.

Economic base multipliers estimated using the Moore and Jacobsen MR equation and the modified LQ technique were compared for three separate groups of geographic regions: 315 MSAs, Illinois and Missouri counties, and the 20 communities in the Gibson and Worden study. Results for the 315 MSAs generally confirm the earlier findings by Isserman that use of the MR approach should be avoided for cities with specialized economies. The present study would extend this recommendation for cities that are more industrially diversified than their population base alone would indicate. On the other hand, examination of 45 "outlier" MSAs (Table 2) indicates the LQ approach may be overly sensitive to short-term trends (i.e., recessions) that may temporarily distort the long-term equilibrium relationship between the service and export sectors of the economy. Finally, results of a matched pairs test revealed that the MR method produced statistically different (smaller) multipliers at the .01 level of significance than the LQ method even though the average LQ multiplier is only 6 percent higher than the corresponding MR multiplier.

A comparison of MR and LQ-based multipliers for Illinois and Missouri revealed the two methods to give results much closer than might otherwise be expected. The modified LQ approach produces multipliers that are, on average, only 2 percent and 3 percent higher than the corresponding MR multipliers for Illinois and Missouri, respectively. However, the null hypothesis of no significant difference between the two methods was rejected for Missouri counties at the .01 level of significance using a matched pairs test. Still, it generally may be concluded that use of either the LQ or MR technique would give similar results for most counties in these two states. Again, exceptions include counties that are either extremely diversified or specialized in terms of economic function and counties experiencing rapid increases or decreases in employment.

Finally, in a reexamination of both survey and non-survey economic base multipliers for 20 Arizona towns, the modified LQ approach performed considerably better than indicated in the study by Gibson and Worden. Even though LQ multipliers can only be calculated at the county geographic level using the prescribed modifications, in 6 out of 12 cases the LQ multipliers came within 15 percent of the fully adjusted survey multiplier. In Greenlee County, where the community surveyed by Gibson and Worden comprises a substantial fraction of the total county economy, the LQ multiplier clearly outperformed the MR multiplier. Moreover, it is disturbing to note that in 13 out of 20 communities the MR technique identified more export activity than the survey, tending to confirm the theoretical view that multipliers produced using the MR method understate the true magnitude of impacts.

Endnote

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Table 1
Summary of Comparison Results For 315 MSAs

Frequency Ratios (LQ/MR)	All MSAs		Manufacuring		Largest Sector Service		Government	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0.60-0.69	3	1.0	0	0.0	1	0.7	2	2.7
0.70-0.79	6	1.9	3	3.5	0	0.0	3	4.0
0.80-0.89	22	7.0	9	10.3	3	2.1	10	13.3
0.90-0.99	63	20.0	22	25.3	12	8.5	27	36.0
1.00-1.09	103	32.7	31	35.6	45	31.9	24	32.0
1.10-1.19	82	26.0	13	14.9	53	37.6	9	12.0
1.20-1.29	24	7.6	5	5.8	19	13.5	0	0.0
1.30-1.39	8	2.5	4	4.6	4	2.8	0	0.0
1.40-1.49	3	1.0	0	0.0	3	2.1	0	0.0
1.50-1.59	0	0.0	0	0.0	0	0.0	0	0.0
1.60-1.69	0	0.0	0	0.0	0	0.0	0	0.0
1.70-1.79	1	0.3	0	0.0	1	0.7	0	0.0
Total	315	100.0	87	100.0	141	99.8	75	100.0

Table 1 (continued)

	All MSAs	Manufacturing	Largest Sector Service	Government
Minimum Ratio	0.624	0.747	0.651	0.624
Maximum Ratio	1.733	1.360	1.733	1.198
Mean Ratio	1.059	1.035	1.114	0.978
Range LQ Multiplier	1.30-4.48	1.45-3.55	1.77-4.48	1.30-3.13
Range MR Multiplier	1.80-4.42	1.88-2.84	1.82-4.42	1.81-3.46
Mean LQ Multiplier	2.41	2.28	2.68	2.10
Mean MR Multiplier	2.27	2.20	2.41	2.12
Median Population	245,738	227,354	321,652	182,202

Table 2
45 MSAs With Multipliers Differing By 20 Percent or More

Metropolitan Area	Population (1980)	Frequency Ratio (LQ/MR)	Multiplier LQ	Multiplier MR	Largest Sector
Boise City, ID mas	173,036	1.73	3.55	2.05	service
Tulsa, OK msa	657,173	1.43	3.61	2.51	service
Amarillo, TX msa	173,699	1.43	2.94	2.05	service
Minneapolis, MN msa	2,137,133	1.42	4.48	3.15	service
Wilmington, DE pmsa	523,221	1.36	3.29	2.42	manufacturing
Portland, OR pmsa	1,105,699	1.36	3.74	2.76	service
Middlesex, NJ pmsa	886,383	1.34	3.55	2.65	manufacturing
Columbus, OH msa	1,243,833	1.34	3.79	2.82	service
Bridgeport, CT necma	807,143	1.34	3.49	2.61	manufacturing
Akron, OH pmsa	660,328	1.34	3.38	2.52	manufacturing
Bismarck, ND msa	79,988	1.32	2.44	1.85	service
Nashville, TN msa	850,505	1.30	3.42	2.63	service
Toledo, OH msa	616,864	1.28	3.18	2.49	service
Santa Barbara, CA msa	298,694	1.27	2.81	2.22	service
Newark, NJ pmsa	1,965,969	1.26	3.88	3.09	service
Kalamazoo, MI msa	212,378	1.26	2.66	2.11	manufacturing
Cincinnati, OH pmsa	1,401,491	1.26	3.63	2.89	service
Tyler, TX msa	128,366	1.25	2.45	1.97	service
Sheboygan, WI msa	100,935	1.25	2.38	1.91	manufacturing
Racine, WI pmsa	173,132	1.25	2.56	2.05	manufacturing
Monroe, LA msa	139,241	1.25	2.48	1.99	service
Dallas, TX pmsa	1,957,378	1.25	3.86	3.09	service

Table 2 (continued)
45 MSAs With Multipliers Differing By 20 Percent or More

Metropolitan Area	Population (1980)	Frequency Ratio (LQ/MR)	Multiplier LQ	Multiplier MR	Largest Sector
Sioux City, IA msa	117,457	1.24	2.42	1.94	service
Jackson, MS msa	362,038	1.24	2.83	2.28	service
Fargo, ND msa	137,574	1.24	2.46	1.99	service
Omaha, NE msa	585,122	1.23	3.02	2.47	service
Charleston, WV msa	269,595	1.23	2.68	2.18	service
Lubbock, TX msa	211,651	1.22	2.58	2.11	service
Little Rock, AR msa	474,484	1.22	2.91	2.38	service
Roanoke, VA msa	220,393	1.21	2.56	2.12	service
Pittsburgh, PA pmsa	2,218,870	1.21	3.83	3.17	service
Peoria IL msa	365,864	1.21	2.77	2.29	manufacturing
Billings, MT msa	108,035	1.21	2.33	1.92	service
Saint Louis, MO msa	2,376,998	1.20	3.87	3.22	service
Portland, ME necma	215,789	1.20	2.54	2.11	service
Bergen, NJ pmsa	1,292,970	1.20	3.42	2.84	manufacturing
Gary, IN pmsa	642,781	0.79	1.99	2.50	manufacturing
Flint, MI msa	450,449	0.79	1.86	2.36	manufacturing
Norfok, VA msa	1,160,311	0.77	2.13	2.78	government
Fayetteville, NC msa	247,160	0.76	1.63	2.16	government
Bremerton, WA msa	147,152	0.76	1.52	2.00	government
Pascagoula, MS msa	118,015	0.75	1.45	1.95	manufacturing
Jacksonville, NC msa	112,784	0.67	1.30	1.93	government
New York, NY pmsa	8,274,961	0.65	2.88	4.42	service
Washington, DC msa	3,250,822	0.62	2.16	3.45	government

Table 3
Summary of Comparison Results For Illinois and Missouri Counties

Frequency Ratios (LQ/MR)	Illinois		Missouri	
	Number	Percent	Number	Percent
0.60-0.69	0	0.0	0	0.0
0.70-0.79	1	1.0	2	1.7
0.80-0.89	4	3.9	3	2.6
0.90-0.99	35	34.3	42	36.5
1.00-1.09	51	50.0	46	40.0
1.10-1.19	9	8.8	19	16.5
1.20-1.29	0	0.0	2	1.7
1.30-1.39	1	1.0	0	0.0
1.40-1.49	0	0.0	1	0.9
1.50-1.59	0	0.0	0	0.0
1.60-1.69	1	1.0	0	0.0
1.70-1.79	0	0.0	0	0.0
Total	102	100.0	115	99.9

Minimum Ratio	0.780	0.710
Maximum Ratio	1.616	1.478
Mean Ratio	1.021	1.032
Range LQ Multiplier	1.25-3.77	1.22-3.11
Range MR Multiplier	1.36-3.89	1.31-2.70
Mean LQ Multiplier	1.75	1.65
Mean MR Multiplier	1.70	1.59
Median Population	26,185	15,873

Table 4
Survey and Non-Survey Economic Base Multipliers For 20 Arizona Communities

County	Town	Population[a]	K_1^b	K_5^b	MR	LQ
Apache		52,108			1.76	1.46
	St. Johns	1,838	1.53	1.29	1.26	
	Springerville	3,637	1.80	1.48	1.34	
				(1.42)		
Coconino		75,008			1.84	1.81
	Page	6,000	1.56	1.38	1.40	
	Sedona	6,500	2.17	1.56	1.41	
	Williams	4,125	1.53	1.38	1.35	
				(1.45)		
Cochise		85,686			1.87	1.56
	Benson	4,750	1.96	1.33	1.37	
	Bisbee	8,750	1.77	1.30	1.45	
	Wilcox	2,804	2.21	1.57	1.30	
				(1.36)		
Gila		37,080			1.69	1.55
	Globe	13,150	1.76	1.35	1.51	
Graham		22,862			1.60	1.63
	Safford	10,855	2.21	1.58	1.48	

Table 4 (continued)
Survey and Non-Survey Economic Base Multipliers

County	Town	Population[a]	K_1^b	K_5^b	MR	LQ
Greenlee		1,406			1.49	1.26
	Clifton	10,000	1.29	1.13	1.47	
Maricopa		1,509,052			2.93	3.33
	Wickenburg	2,908	2.23	1.66	1.31	
Mohave		55,865			1.77	1.91
	Lake Havasu City	15,000	2.01	1.65	1.53	
Navajo		67,629			1.81	1.76
	Holbrook	5,993	1.77	1.68	1.40	
	Show Low	3,600	1.86	1.46	1.33	
	Snowflake	4,176	1.72	1.29	1.35	
				(1.50)		
Pinal		90,918			1.88	1.56
	Superior	5,450	1.36	1.13	1.39	
Yavapai		68,145			1.82	1.90
	Payson	3,000	2.48	1.65	1.31	
	Verde Valley	9,255	2.57	1.60	1.46	
				(1.61)		
Yuma		90,554			1.88	1.81
	Parker	9,000	1.91	1.62	1.45	

Table 4 (continued)
Survey and Non-Survey Economic Base Multipliers

[a]Source: 1980 Census and Gibson and Worden (1981).

[b]Source: Gibson and Worden (1981). K_1 is the baseline survey multiplier adjusted for in-commuters and FTE employment. K_5 is the baseline survey multiplier adjusted for out-commuters, wage differences,and transfer payments.

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
New York, NY pmsa	8,274,961	2.88	4.42	service
Los Angles, CA pmsa	7,477,503	4.08	4.29	service
Chicago, IL pmsa	6,060,387	3.97	4.04	service
Philadelphia, PA pmsa	4,716,818	4.13	3.78	service
Detroit MI pmsa	4,488,072	4.00	3.74	service
Boston, MA necma	3,662,832	3.59	3.55	service
Washington, DC msa	3,250,822	2.16	3.45	government
Houston, TX pmsa	2,735,766	3.28	3.32	service
Nassau, NY pmsa	2,605,813	3.29	3.28	service
Saint Louis, MO msa	2,376,998	3.87	3.22	service
Pittsburgh, PA pmsa	2,218,870	3.83	3.17	service
Baltimore, MD msa	2,199,531	3.26	3.17	service
Atlanta, GA msa	2,138,231	3.47	3.15	service
Minneapolis, MN msa	2,137,133	4.48	3.15	service
Newark, NJ pmsa	1,965,969	3.88	3.09	service
Dallas, TX pmsa	1,957,378	3.86	3.09	service
Anaheim, CA pmsa	1,932,709	3.16	3.08	service
Cleveland, OH pmsa	1,898,825	3.65	3.07	service
San Diego, CA msa	1,861,846	2.64	3.06	government
Oakland, CA pmsa	1,761,759	3.56	3.02	service
Miami, FL pmsa	1,625,781	3.04	2.97	service

Appendix I (continued)
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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Tampa, FL msa	1,613,603	3.31	2.97	service
Seattle, WA pmsa	1,607,469	3.37	2.97	service
Riverside, CA pmsa	1,558,182	2.67	2.95	service
Phoenix, AZ msa	1,509,052	3.33	2.93	service
San Francisco, CA pmsa	1,488,871	2.98	2.92	service
Kansas City, MO msa	1,433,458	3.47	2.90	service
Denver, CO pmsa	1,428,836	3.37	2.90	service
Cincinnati, OH pmsa	1,401,491	3.63	2.89	service
Milwaukee, WI pmsa	1,397,143	3.09	2.88	service
San Jose, CA pmsa	1,295,071	2.30	2.84	manufacturing
Bergen, NJ pmsa	1,292,970	3.42	2.84	manufacturing
New Orleans, LA msa	1,256,256	3.24	2.83	service
Columbus, OH msa	1,243,833	3.79	2.82	service
Indianapolis, IN msa	1,166,575	3.32	2.79	service
Norfolk, VA msa	1,160,311	2.13	2.78	government
Portland, OR pmsa	1,105,699	3.74	2.76	service
Sacramento, CA msa	1,099,814	2.47	2.76	government
San Antonio, TX msa	1,071,954	2.79	2.74	government
Hartford, CT necma	1,051,606	2.70	2.73	manufacturing
Fort Lauderdale, FL pmsa	1,018,200	2.92	2.72	service
Buffalo, NY pmsa	1,015,472	3.03	2.72	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Fort Worth, TX pmsa	973,138	3.05	2.69	service
Charlotte, NC msa	971,391	3.00	2.69	manufacturing
Rochester, NY msa	971,230	2.35	2.69	manufacturing
Louisville, KY msa	956,756	3.17	2.69	service
Dayton, OH msa	942,083	2.80	2.68	service
Memphis, TN msa	913,472	3.12	2.66	service
Salt Lake City, UT msa	910,222	3.12	2.66	service
Middlesex, NJ pmsa	886,383	3.55	2.65	manufacturing
Birmingham, AL msa	883,946	2.77	2.65	service
Providence, RI necma	865,771	2.87	2.64	manufacturing
Oklahoma City, Ok msa	860,969	3.13	2.64	government
Greensboro, NC msa	851,851	3.11	2.63	manufacturing
Nashville, TN msa	850,505	3.42	2.63	service
Monmouth, NJ pmsa	849,211	2.67	2.63	service
Albany, NY msa	835,880	2.70	2.62	government
Bridgeport, CT necma	807,143	3.49	2.61	manufacturing
Honolulu, HI msa	762,565	2.33	2.58	government
New Haven, CT necma	761,337	2.97	2.58	service
Richmond, VA msa	761,311	3.05	2.58	government
Scranton, PA msa	728,796	2.68	2.56	manufacturing
Jacksonville, FL msa	722,252	2.67	2.56	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Orlando, FL msa	700,055	2.86	2.54	service
Akron, OH pmsa	660,328	3.38	2.52	manufacturing
Tulsa, OK msa	657,173	3.61	2.51	service
Worcester, MA necma	646,352	2.68	2.51	manufacturing
Syracuse, NY msa	642,971	2.92	2.51	service
Gary, IN pmsa	642,781	1.99	2.50	manufacturing
Allentown, PA msa	635,481	2.94	2.50	manufacturing
Toledo, OH msa	616,864	3.18	2.49	service
Grand Rapids, MI msa	601,680	2.76	2.48	manufacturing
Omaha, NE msa	585,122	3.02	2.47	service
Springfield, MA necma	581,831	2.64	2.46	service
West Palm Beach, FL msa	576,863	2.49	2.46	service
Greenville, SC msa	569,066	2.55	2.45	manufacturing
Knoxville, TN msa	565,970	2.68	2.45	service
Raleigh, NC msa	561,222	2.82	2.45	service
Jersey City, NJ pmsa	556,972	2.30	2.45	manufacturing
Harrisburg, PA msa	555,158	2.74	2.44	government
Austin, TX msa	536,688	2.50	2.43	government
Tucson, AZ msa	531,443	2.43	2.43	service
Youngstown, OH msa	531,350	2.19	2.43	manufacturing
Oxnard, CA pmsa	529,174	2.45	2.43	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Wilmington, DE pmsa	523,221	3.29	2.42	manufacturing
Fresno, CA msa	514,621	2.52	2.41	service
Baton Rouge, LA msa	494,151	2.41	2.40	service
Tacoma, WA pmsa	485,643	2.39	2.39	government
El Paso, TX msa	479,899	2.42	2.39	government
New Bedford, MA necma	474,641	2.30	2.38	manufacturing
Little Rock, AR msa	474,484	2.91	2.38	service
Las Vegas, NV msa	463,087	2.00	2.37	service
Flint, MI msa	450,449	1.86	2.36	manufacturing
Mobile, AL msa	443,536	2.62	2.36	service
Lake County, IL pmsa	440,372	2.43	2.35	government
Johnson City, TN msa	433,638	2.24	2.35	manufacturing
Charleston, SC msa	430,462	2.10	2.35	government
Chattanooga, TN msa	426,540	2.54	2.34	manufacturing
Saginaw, MI msa	421,518	2.27	2.34	manufacturing
Lansing, MI msa	419,750	2.16	2.34	government
Albuquerque, NM msa	419,700	2.65	2.34	service
Wichita, KS msa	411,313	2.50	2.33	manufacturing
Columbia, SC msa	410,088	2.49	2.33	government
Canton, OH msa	404,421	2.40	2.32	manufacturing
Bakersfield, CA msa	403,089	2.25	2.32	government

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Davenport, IA msa	383,958	2.44	2.30	manufacturing
York, PA msa	381,255	2.15	2.30	manufacturing
Beaumont, TX msa	375,497	2.12	2.30	service
Des Moines, IA msa	367,561	2.67	2.29	service
Peoria, IL msa	365,864	2.77	2.29	manufacturing
Lancaster, PA msa	362,346	2.20	2.28	manufacturing
Jackson, MS msa	362,038	2.83	2.28	service
Joliet, IL pmsa	355,042	2.33	2.28	service
Fort Wayne, IN msa	354,156	2.61	2.28	manufacturing
Stockton, CA msa	347,342	2.43	2.27	service
Augusta, GA msa	345,918	2.07	2.27	government
Spokane, WA msa	341,835	2.68	2.26	service
Huntington, WV msa	336,410	2.71	2.26	service
Vallejo, CA pmsa	334,402	2.11	2.26	government
Shreveport, LA msa	333,079	2.67	2.25	service
Corpus Christi, TX msa	326,228	2.52	2.25	service
Madison, WI msa	323,545	2.55	2.24	government
Lakeland, FL msa	321,652	2.49	2.24	service
Utica, NY msa	320,180	2.28	2.24	government
Lexington, KY msa	317,629	2.53	2.24	service
Aurora, IL pmsa	315,607	2.53	2.24	manufacturing

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Reading, PA msa	312,509	2.39	2.23	manufacturing
Colorado Springs, CO msa	309,424	2.19	2.23	government
Trenton, NJ pmsa	307,863	2.37	2.23	government
Santa Rosa, CA pmsa	299,681	2.29	2.22	service
Santa Barbara, CA msa	298,694	2.81	2.22	service
Appleton, WI msa	291,369	2.32	2.21	manufacturing
Salinas, CA msa	290,444	1.91	2.21	government
Pensacola, FL msa	289,782	2.13	2.21	government
McCallen TX msa	283,229	2.14	2.20	trade
Erie, PA msa	279,780	2.21	2.20	manufacturing
Rockford, IL msa	279,514	2.23	2.20	manufacturing
Manchester, NH necma	276,608	2.39	2.19	manufacturing
Atlantic City, NJ msa	276,385	2.05	2.19	service
Evansville, IN msa	276,252	2.23	2.19	service
Portsmouth, NH necma	275,753	2.13	2.19	manufacturing
Eugene, OR msa	275,226	2.40	2.19	service
Lorain, OH pmsa	274,909	2.04	2.19	manufacturing
Melbourne, FL msa	272,959	2.03	2.19	service
Montgomery, AL msa	272,687	2.51	2.19	government
Charleston, WV msa	269,595	2.68	2.18	service
Duluth, MN msa	266,650	2.43	2.18	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Modesto, CA msa	265,900	2.19	2.18	service
Ann Arbor, MI pmsa	264,748	2.07	2.18	government
Johnstown, PA msa	264,506	2.13	2.18	service
Macon, GA msa	263,591	2.14	2.18	government
Binghamton, NY msa	263,460	2.14	2.18	manufacturing
Orange County, NY pmsa	259,603	2.26	2.17	government
Hamilton, OH pmsa	258,787	2.52	2.17	manufacturing
Daytona Beach, FL msa	258,762	2.35	2.17	service
Salem, OR msa	249,895	2.24	2.16	government
Fayetteville, NC msa	247,160	1.63	2.16	government
Visalia, CA msa	245,738	1.95	2.15	agriculture
Poughkeepsie, NY msa	245,055	1.90	2.15	manufacturing
South Bend, IN msa	241,617	2.37	2.15	service
Columbus, GA msa	239,196	1.99	2.15	government
New London, CT necma	238,409	1.75	2.14	manufacturing
Niagara Falls, NY pmsa	227,354	2.02	2.13	manufacturing
Savannah, GA msa	220,553	2.49	2.12	service
Roanoke, VA msa	220,393	2.56	2.12	service
Provo, UT msa	218,106	2.10	2.12	service
Portland, ME necma	215,789	2.54	2.11	service
Killeen, TX msa	214,656	1.71	2.11	government

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Region	Population (1980)	Multipliers LQ	Multipliers MR	Largest Sector
Kalamazoo, MI msa	212,378	2.66	2.11	manufacturing
Lubbock, TX msa	211,651	2.58	2.11	service
Brownsville, TX msa	209,727	2.41	2.11	trade
Springfield, MO msa	207,704	2.46	2.10	service
Fort Myers, FL msa	205,266	2.31	2.10	service
Beaver County, PA pmsa	204,441	1.76	2.10	manufacturing
Hickory, NC msa	202,711	1.99	2.10	manufacturing
Sarasota, FL msa	202,251	2.45	2.09	service
Huntsville, AL msa	196,966	1.76	2.09	government
Galveston, TX pmsa	195,940	2.02	2.08	government
Reno, NV msa	193,623	2.32	2.08	service
Lincoln, NE msa	192,884	2.44	2.08	service
Vancouver, WA pmsa	192,227	2.16	2.08	service
Lafayette, LA msa	190,231	2.11	2.08	service
Tallahassee, FL msa	190,220	2.08	2.08	government
Boulder, CO pmsa	189,625	2.15	2.08	manufacturing
Santa Cruz, CA pmsa	188,141	2.14	2.07	service
Springfield, IL msa	187,789	2.14	2.07	service
Wheeling, WV msa	185,566	2.12	2.07	service
Biloxi, MS msa	182,202	1.75	2.06	government
Houma, LA msa	176,876	1.84	2.06	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Green Bay, WI msa	175,280	2.23	2.05	manufacturing
Anchorage, AK msa	174,431	2.26	2.05	government
Amarillo, TX msa	173,699	2.94	2.05	service
Racine, WI pmsa	173,132	2.56	2.05	manufacturing
Boise City, ID msa	173,036	3.55	2.05	service
Yakima, WA msa	172,508	2.30	2.05	service
Gainesville, FL msa	171,371	2.00	2.05	government
Benton Harbor, MI msa	171,276	2.32	2.05	manufacturing
Waco, TX msa	170,755	2.42	2.05	service
Cedar Rapids, IA msa	169,775	2.23	2.04	manufacturing
Brazoria, TX pmsa	169,587	1.72	2.04	manufacturing
Champaign, IL msa	168,392	2.06	2.04	government
Lake Charles, LA msa	167,223	2.07	2.04	service
Saint Cloud, MN msa	163,256	2.24	2.03	trade
Steubenville, OH msa	163,099	1.65	2.03	manufacturing
Fort Smith, AR msa	162,813	2.24	2.03	manufacturing
Waterloo, IA msa	162,781	2.03	2.03	manufacturing
Asheville, NC msa	160,934	2.42	2.03	manufacturing
Parkersburg, WV msa	157,914	2.06	2.02	manufacturing
Muskegon, MI msa	157,589	1.99	2.02	manufacturing
Topeka, KS msa	154,916	2.26	2.02	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Lima, OH msa	154,795	2.04	2.02	manufacturing
Longview, TX msa	151,752	2.08	2.01	manufacturing
Jackson, MI msa	151,495	2.25	2.01	manufacturing
Fort Pierce, FL msa	151,196	2.19	2.01	service
Clarksville, TN msa	150,220	1.68	2.01	government
Fort Collins, CO msa	149,184	2.05	2.01	government
Bradenton, FL msa	148,442	2.11	2.01	trade
Bremerton, WA msa	147,152	1.52	2.00	government
Pittsfield, MA necma	145,110	2.06	2.00	service
Richland, WA msa	144,469	1.77	2.00	service
Chico, CA msa	143,851	2.15	2.00	service
Battle Creek, MI msa	141,557	2.04	1.99	manufacturing
Lynchburg, VA msa	141,289	2.25	1.99	manufacturing
Janesville, WI msa	139,420	2.06	1.99	manufacturing
Anderson, IN msa	139,336	1.77	1.99	manufacturing
Monroe, LA msa	139,241	2.48	1.99	service
Fargo, ND msa	137,574	2.46	1.99	service
Tuscaloosa, AL msa	137,541	1.95	1.99	government
Elkhart, IN msa	137,330	1.93	1.99	manufacturing
Terre Haute, IN msa	137,247	2.25	1.99	service
Bangor, ME necma	137,015	2.11	1.98	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Altoona, PA msa	136,621	2.10	1.98	service
Alexandria, LA msa	135,282	2.18	1.98	government
Florence, AL msa	135,065	1.93	1.98	government
Anderson, SC msa	133,235	1.84	1.98	manufacturing
Vineland, NJ pmsa	132,866	1.97	1.98	manufacturing
Medford, OR msa	132,456	2.18	1.98	service
Decatur, IL msa	131,375	2.05	1.97	manufacturing
Mansfield, OH msa	131,205	1.98	1.97	manufacturing
Eau Claire, WI msa	130,932	2.16	1.97	trade
Athens, GA msa	130,015	1.94	1.97	government
Muncie, IN msa	128,587	2.18	1.97	service
Tyler, TX msa	128,366	2.45	1.97	service
Sharon, PA msa	128,299	1.84	1.97	manufacturing
Joplin, MO msa	127,513	2.25	1.97	manufacturing
Pueblo, CO msa	125,972	2.01	1.96	service
Olympia, WA msa	124,264	1.92	1.96	government
Greeley, CO msa	123,438	2.00	1.96	government
Kenosha, WI pmsa	123,137	1.85	1.96	manufacturing
Ocala, FL msa	122,488	2.27	1.96	trade
Dothan, AL msa	122,453	1.86	1.96	government
Lafayette, IN msa	121,702	1.98	1.95	government

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Wichita Falls, TX msa	121,082	2.01	1.95	government
Burlington, VT necma	120,147	2.13	1.95	service
Anniston, AL msa	119,761	1.80	1.95	government
Bloomington, IL msa	119,149	2.12	1.95	service
Williamsport, PA msa	118,416	2.08	1.95	manufacturing
Pascagoula, MS msa	118,015	1.45	1.95	manufacturing
Sioux City, IA msa	117,457	2.42	1.94	service
Redding, CA msa	115,715	2.15	1.94	service
Odessa, TX msa	115,374	1.99	1.94	trade
Charlottesville, VA msa	113,568	1.93	1.94	government
Hagerstown, MD msa	113,086	1.98	1.93	manufacturing
Texarkana, AR msa	113,067	1.93	1.93	government
Jacksonville, NC msa	112,784	1.30	1.93	government
State College, PA msa	112,760	1.77	1.93	government
Lawton, OK msa	112,456	1.68	1.93	government
Albany, GA msa	112,402	2.01	1.93	government
Danville, VA msa	111,789	1.81	1.93	manufacturing
Wausau, WI msa	111,270	1.98	1.93	manufacturing
Abilene, TX msa	110,932	2.17	1.93	service
Florence, SC msa	110,163	2.11	1.93	manufacturing
Fort Walton Beach, FL msa	109,920	1.64	1.93	government
Glens Falls, NY msa	109,649	1.92	1.93	service

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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Sioux Falls, SD msa	109,435	2.18	1.93	service
Billings, MT msa	108,035	2.33	1.92	service
Cumberland, MD msa	107,782	2.07	1.92	service
Bellingham, WA msa	106,701	2.13	1.92	service
Kokomo, IN msa	103,715	1.64	1.91	manufacturing
Wilmington, NC msa	103,471	2.21	1.91	trade
Gadsden, AL msa	103,057	1.83	1.91	manufacturing
Kankakee, IL msa	102,926	2.07	1.91	government
Yuba City, CA msa	101,979	1.86	1.91	government
Sheboygan, WI msa	100,935	2.38	1.91	manufacturing
Fayetteville, AR msa	100,494	2.17	1.91	government
Columbia, MO msa	100,376	1.94	1.91	government
Lewiston, ME necma	99,657	2.03	1.90	manufacturing
Burlington, NC msa	99,319	2.05	1.90	manufacturing
Laredo, TX msa	99,258	2.13	1.90	trade
Bloomington, IN msa	98,785	1.86	1.90	government
Panama, FL msa	97,740	2.00	1.90	government
Elmira, NY msa	97,656	2.08	1.90	manufacturing
Las Cruces, NM msa	96,340	1.75	1.90	government
Dubuque, IA msa	93,745	1.85	1.89	service
Bryan, TX msa	93,588	2.05	1.89	government
Santa Fe, NM msa	92,959	1.86	1.89	government

Appendix I (continued)
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Region	Population (1980)	Multipliers LQ	MR	Largest Sector
Rochester, MN msa	92,006	1.81	1.88	service
La Crosse, WI msa	91,056	2.11	1.88	service
Pine Bluff, AR msa	90,718	1.97	1.88	service
Sherman, TX msa	89,796	2.03	1.88	manufacturing
Saint Joseph, MO msa	87,888	2.08	1.87	service
Naples, FL msa	85,971	2.06	1.87	service
Owensboro, KY msa	85,949	2.11	1.87	service
San Angelo, TX msa	84,784	2.10	1.86	service
Midland, TX msa	82,636	2.07	1.86	mining
Iowa City, IA msa	81,717	1.83	1.86	government
Great Falls, MT msa	80,696	2.22	1.85	government
Bismarck, ND msa	79,988	2.44	1.85	service
Jackson, TN msa	74,546	2.11	1.83	service
Casper, WY msa	71,856	2.11	1.83	service
Victoria, TX msa	68,807	1.95	1.82	service
Cheyenne, WY msa	68,649	1.94	1.82	government
Lawrence, KS msa	67,640	1.89	1.81	government
Grand Forks, ND msa	66,100	1.93	1.81	government
Enid, OK msa	62,820	2.08	1.80	trade

Appendix II

County	Population (1980)	Multipliers LQ	MR
Cook	5,253,655	3.77	3.89
Du Page	658,835	3.31	2.52
Lake	440,372	2.43	2.35
Will	324,460	2.33	2.25
Kane	278,405	2.59	2.19
St. Clair	267,531	2.19	2.18
Winnebago	250,884	2.21	2.16
Madison	247,691	2.08	2.16
Peoria	200,466	3.38	2.09
Sangamon	176,089	2.12	2.05
Champaign	168,392	2.06	2.04
Rock Island	165,968	2.14	2.04
McHenry	147,897	2.17	2.01
Tazewell	132,078	1.62	1.98
Macon	131,375	2.05	1.97
McLean	119,149	2.12	1.95
LaSalle	112,033	2.03	1.93
Kankakee	102,926	2.07	1.91
Vermilion	95,222	1.87	1.89
DeKalb	74,624	2.05	1.84
Adams	71,622	2.10	1.83
Whiteside	65,970	1.68	1.81
Knox	61,607	1.87	1.79
Jackson	61,522	1.86	1.79
Henry	57,968	1.92	1.78
Williamson	56,538	1.76	1.77
Coles	52,260	2.00	1.76
Stephenson	49,536	1.65	1.75
Macoupin	49,384	1.77	1.75
Ogle	46,338	1.81	1.73
Fulton	43,687	1.79	1.72
Marion	43,523	1.86	1.72
Franklin	43,201	1.80	1.72
Livingston	41,381	1.72	1.71
Bureau	39,114	1.69	1.70
Morgan	37,502	1.90	1.69
McDonough	37,467	1.70	1.69
Kendall	37,202	1.32	1.69
Jefferson	36,552	1.89	1.69
Christian	36,446	1.70	1.69
Lee	36,328	1.71	1.68
Randolph	35,652	1.65	1.68

Appendix II (continued)

County	Population (1980)	Multipliers LQ	MR
Woodford	33,320	1.55	1.67
Iroquois	32,976	1.66	1.67
Clinton	32,617	1.76	1.66
Logan	31,802	1.70	1.66
Montgomery	31,686	1.78	1.66
Effingham	30,944	1.80	1.65
Grundy	30,582	1.56	1.65
Boone	28,630	1.45	1.64
Saline	28,448	1.84	1.64
Shelby	23,923	1.62	1.61
Hancock	23,877	1.73	1.61
Jo Daviess	23,520	1.61	1.61
Fayette	22,167	1.76	1.59
Warren	21,943	1.68	1.59
Edgar	21,725	1.55	1.59
Perry	21,714	1.47	1.59
Crawford	20,818	1.53	1.58
Jersey	20,538	1.69	1.58
Monroe	20,117	1.66	1.58
Douglas	19,774	1.48	1.58
Mason	19,492	1.49	1.57
Mercer	19,286	1.66	1.57
Pike	18,896	1.57	1.57
Carroll	18,779	1.54	1.57
DeWitt	18,108	1.44	1.56
Wayne	18,059	1.66	1.56
White	17,864	1.79	1.56
Lawrence	17,807	1.50	1.56
Union	17,765	1.47	1.56
Richland	17,587	1.64	1.56
Clark	16,913	1.61	1.55
Greene	16,661	1.58	1.55
Piatt	16,581	1.51	1.55
Bond	16,224	1.59	1.54
Washington	15,472	1.54	1.54
Clay	15,283	1.63	1.53
Ford	15,265	1.54	1.53
Cass	15,084	1.42	1.53
Massac	14,990	1.46	1.53
Moultrie	14,546	1.60	1.53
Marshall	14,479	1.45	1.52
Wabash	13,713	1.44	1.52
Alexander	12,264	1.57	1.50
Menard	11,700	1.49	1.49

Appendix II (continued)

County	Population (1980)	Multipliers LQ	MR
Jasper	11,318	1.42	1.49
Cumberland	11,062	1.45	1.48
Johnson	9,624	1.44	1.46
Hamilton	9,172	1.52	1.46
Henderson	9,114	1.40	1.46
Pulaski	8,840	1.35	1.45
Schuyler	8,365	1.55	1.44
Edwards	7,961	1.28	1.44
Gallatin	7,590	1.40	1.43
Stark	7,389	1.33	1.43
Scott	6,142	1.34	1.40
Putnam	6,085	1.25	1.40
Calhoun	5,867	1.39	1.39
Brown	5,411	1.49	1.38
Hardin	5,383	1.46	1.38
Pope	4,404	1.32	1.36

Appendix III

County	Population (1980)	Multipliers LQ	MR
St. Louis	973,896	3.11	2.70
Jackson	629,266	2.87	2.50
St. Louis City	453,085	2.53	2.37
Greene	185,302	2.43	2.07
Jefferson	146,183	2.00	2.00
St. Charles	144,107	2.18	2.00
Clay	136,488	2.93	1.98
Boone	100,376	1.94	1.91
Buchanan	87,888	2.08	1.87
Jasper	86,958	2.22	1.87
Franklin	71,233	1.94	1.82
Cape Girardeau	58,837	1.98	1.78
Cole	56,663	2.03	1.77
Cass	51,029	1.75	1.75
Platte	46,341	1.35	1.73
St. Francois	42,600	1.92	1.72
Pulaski	42,011	1.22	1.71
Newton	40,555	1.67	1.71
Scott	39,647	1.96	1.70
Johnson	39,059	1.54	1.70
Butler	37,693	1.92	1.69
Pettis	36,378	1.92	1.69
Dunklin	36,324	1.60	1.68
Phelps	33,633	1.71	1.67
Callaway	32,252	1.45	1.66
Lafayette	29,925	1.75	1.65
Stoddard	29,009	1.66	1.64
Lawrence	28,973	1.63	1.64
Howell	28,807	1.75	1.64
Marion	28,638	1.92	1.64
Audrain	26,458	1.79	1.63
Randolph	25,460	1.80	1.62
Pemiscot	24,987	1.49	1.62
Saline	24,919	1.70	1.62
Adair	24,870	1.73	1.61
Barry	24,408	1.50	1.61
Iaclede	24,323	1.64	1.61
New Madrid	22,945	1.39	1.60
Christian	22,402	1.54	1.60
Lincoln	22,193	1.72	1.60
Nodaway	21,996	1.69	1.59
Ray	21,378	1.60	1.59

Appendix III (continued)

County	Population (1980)	Multipliers LQ	MR
Texas	21,070	1.52	1.59
Taney	20,467	1.72	1.58
Webster	20,414	1.49	1.58
Camden	20,017	1.76	1.58
Vernon	19,806	1.64	1.58
Henry	19,672	1.72	1.57
Polk	18,822	1.58	1.57
Miller	18,532	1.64	1.56
Crawford	18,300	1.55	1.56
Washington	17,983	1.47	1.56
Pike	17,568	1.60	1.56
Perry	16,784	1.86	1.55
Macon	16,313	1.55	1.54
Wright	16,188	1.60	1.54
Clinton	15,916	1.67	1.54
Bates	15,873	1.66	1.54
Livingston	15,739	1.80	1.54
Mississippi	15,726	1.51	1.54
Stone	15,587	1.49	1.54
Linn	15,495	1.65	1.54
Ste. Genevieve	15,180	1.45	1.53
McDonald	14,917	1.41	1.53
Warren	14,900	1.53	1.53
Cooper	14,643	1.67	1.53
Dent	14,517	1.53	1.53
Andrew	13,980	1.49	1.52
Morgan	13,807	1.64	1.52
Gasconade	13,181	1.50	1.51
Ripley	12,458	1.45	1.50
Benton	12,183	1.61	1.50
Carroll	12,131	1.47	1.50
Dallas	12,096	1.44	1.50
Moniteau	12,068	1.50	1.50
Osage	12,014	1.44	1.50
Grundy	11,959	1.69	1.50
Cedar	11,894	1.49	1.49
Douglas	11,594	1.41	1.49
Montgomery	11,537	1.50	1.49
Barton	11,292	1.49	1.49
Wayne	11,277	1.47	1.49
Iron	11,084	1.79	1.48
Lewis	10,901	1.45	1.48
Madison	10,725	1.48	1.48
Chariton	10,489	1.56	1.48

Appendix III (continued)

County	Population (1980)	Multipliers LQ	MR
Bollinger	10,301	1.45	1.47
Oregon	10,238	1.46	1.47
Howard	10,008	1.64	1.47
Harrison	9,890	1.63	1.47
Monroe	9,716	1.46	1.46
Ralls	8,911	1.26	1.45
Daviess	8,905	1.41	1.45
Caldwell	8,660	1.49	1.45
St. Clair	8,622	1.48	1.45
Atchison	8,605	1.42	1.45
Clark	8,493	1.41	1.45
DeKalb	8,222	1.50	1.44
Ozark	7,961	1.44	1.44
Gentry	7,887	1.55	1.43
Shannon	7,885	1.39	1.43
Shelby	7,826	1.42	1.43
Maries	7,551	1.41	1.43
Sullivan	7,434	1.41	1.43
Dade	7,383	1.46	1.43
Reynolds	7,230	1.29	1.42
Holt	6,882	1.48	1.42
Hickory	6,367	1.36	1.41
Putnam	6,092	1.50	1.40
Knox	5,508	1.51	1.39
Carter	5,428	1.36	1.38
Scotland	5,415	1.46	1.38
Schuyler	4,979	1.41	1.37
Mercer	4,685	1.61	1.37
Worth	3,008	1.42	1.31