

**NEW JERSEY'S LINK TO THE 21ST CENTURY:
MAXIMIZING THE IMPACT OF
INFRASTRUCTURE INVESTMENT**

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DEVELOPMENT OF THE SERVICE EMPLOYMENT MULTIPLIER

By:

Ellen Thorson
Jose Holguin-Veras
Claire E. McKnight

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University Transportation Research Center

Region II

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Introduction

A central component of the New Jersey: Link to the 21st Century project is the calibration of TRANUS, a land use-transportation model, for use in the study of northern New Jersey. The model will be used to forecast the impact of transportation investments on economic activity in the study area. Within TRANUS, the distribution of population within the region will be a function of basic (e.g., manufacturing) economic activity, which will be exogenous to the model. Service employment (employment in industries that serve the local residents, such as grocery stores) will then be a function of population. Two multipliers are required – one which relates population to employment and one which relates service employment to population. These relationships are expressed as:

$$P = \alpha E \Rightarrow \alpha = P/E \qquad E_S = \beta P \Rightarrow \beta = E_S/P$$

Where: P is the population, E is the total employment, E_S is the service employment, α is the population to employment multiplier, and β is the employment multiplier.

These equations express the concept that employment in basic economic sectors results in increased population which in turn increases service employment. Since α is just the ratio of total population to total employment, it is very easy to calculate. The calculation of β , on the other hand, is more involved since it requires a determination of service employment. This paper describes the development of the service employment to population multiplier for the study area.

Data and Method

Data on employment and population for the 14 counties in the study area were obtained from the New Jersey Department of Labor (NJDOL). The employment data were from “Employment and Wages Covered by Unemployment Insurance for all New Jersey municipalities as of the third quarter 1993” and included a municipal code, four-digit SIC code, count of establishments in municipality, and employment (by SIC code) for each month of the third quarter of 1993. The employment figures do not include all applicable employment due to 1) incomplete information supplied by the employers and 2) confidentiality requirements. “Data identifiable to individual employers or employing establishments” may not be released. To meet

the requirement, NJDOL suppresses data if there are less than three establishments in the relevant industry in the municipality or if one establishment employs 80% or more of the employees in the industry.

To simplify the data, employment figures for each municipality by four-digit SIC code were aggregated to two-digit SIC codes and the average employment for the quarter was calculated. The next step was to assign each SIC code to either basic or service employment. The authors made the assignment based on their best, joint judgment. There were several SIC categories which the authors agreed might be either service or basic depending on the nature or size of the establishment; for example, “printing and publishing” might be a small firm which meets the local needs of residents and small businesses or it might print or publish for the national market. Since that information was not readily available, each SIC category was assigned according to best judgment. Table 1 shows the SIC categories and their assignments. The employment figures for each municipality/SIC combination were aggregated to the county level and allocated to either basic or service employment based on the assignments in Table 1. The basic and service employment for each county were summed to determine the total for the study area. This is shown on the left side of Table 2.

Because the employment figures were incomplete (as explained above), the total service employment figure from Table 2 cannot be used to develop the multiplier. To factor it up, total employment (more specifically, total employment covered by unemployment insurance) was needed. However, the appropriate data was not available for 1993, the year for the SIC code data. Total employment was available for 1994, so that number was used instead. In order to use this figure, two assumptions were made. First, that the jobs missing from the SIC categorized data were either basic or service in the same proportion as the jobs that were included in the data. Second, that the same ratio of service to total jobs holds true for 1994 and subsequent years. The ratio of service to total employment (approximately 0.73) was calculated from the 1993 SIC coded data, and this proportion was applied to the 1994 total (covered) employment to estimate the number of private sector service jobs in the study area in 1994. This calculation results in approximately 1.7 million service jobs out of a total of 2.4 million jobs. (Comment: Table 2 shows a much larger figure for total employment in 1994 than in 1993, although both represent employment covered by unemployment insurance. The economy was improving in this period; however, nationally the number of people employed increased by only 3%, according to the

Bureau of Labor Statistics. Therefore this difference is probably due primarily to the confidentiality requirements.) The 1994 population data for the study area was also obtained from NJDOL; it had been estimated from the 1990 census data. The multipliers were calculated as (see Table 2):

$$\alpha = (94 \text{ population}) / (94 \text{ employment}) = 2.64$$

$$\beta = (94 \text{ service employment}) / (94 \text{ population}) = 0.28$$

Table 1: Assignment of Industries to Basic or Service Employment

SIC cc Basic Industry	Number of establishment	Total quarterly employment	Total number of towns	Initial basis / service assignment	Final basis / service assignment
1 AGRICULTURAL PRODUCTION - CROPS	47	486	10	B	B
22 TEXTILE MILL PRODUCTS	127	5394	12	B	B
23 APPAREL AND OTHER TEXTILE PRODU	869	20411	31	B	B
26 PAPER AND ALLIED PRODUCTS	107	6999	19	B	B
28 CHEMICALS AND ALLIED PRODUCTS	288	24714	31	B	B
29 PETROLEUM AND COAL PRODUCTS	9	1075	2	B	B
30 RUBBER AND MISC. PLASTICS PRODUC	366	15169	62	B	B
31 LEATHER AND LEATHER PRODUCTS	8	770	2	B	B
33 PRIMARY METAL INDUSTRIES	15	725	4	B	B
34 FABRICATED METAL PRODUCTS	406	10679	45	B	B
35 INDUSTRIAL MACHINERY AND EQUIPM	750	8537	80	B	B
36 ELECTRONIC & OTHER ELECTRIC EQUI	152	6960	30	B	B
37 TRANSPORTATION EQUIPMENT	12	281	4	B	B
38 INSTRUMENTS AND RELATED PRODUC	100	7993	25	B	B
42 TRUCKING AND WAREHOUSING	3237	53853	226	B	B
44 WATER TRANSPORTATION	133	3517	23	B	B
45 TRANSPORTATION BY AIR	111	15069	8	B	B
62 SECURITY AND COMMODITY BROKERS	482	16042	55	B	B
63 INSURANCE CARRIERS	321	18929	39	B	B
39 MISCELLANEOUS MANUFACTURING IN	158	4456	29	S/B	B
50 WHOLESALE TRADE DURABLE GOODS	9061	109607	263	S/B	B
51 WHOLESALE TRADE NONDURABLE GC	5122	70990	219	S/B	B

SIC cc Basic Industry	Number of establishment	Total quarterly employment	Total number of towns	Initial basis / service assignment	Final basis / service assignment
7 AGRICULTURAL SERVICES	2770	11492	263	S	S
9 FISHING, HUNTING, AND TRAPPING	11	12	3	S	S
15 GENERAL BUILDING CONTRACTORS	4836	17105	313	S	S
16 HEAVY CONSTRUCTION, EXCEPT BUIL	236	5352	48	S	S
17 SPECIAL TRADE CONTRACTORS	9147	46064	300	S	S
24 LUMBER AND WOOD PRODUCTS	61	813	13	S	S
32 STONE, CLAY, AND GLASS PRODUCTS	38	1288	10	S	S
41 LOCAL AND INTERURBAN PASSENGER	413	5683	59	S	S
47 TRANSPORTATION SERVICES	1266	9735	138	S	S
49 ELECTRIC, GAS, AND SANITARY SERVI	67	1732	16	S	S
52 BUILDING MATERIALS & GARDEN SUP	469	6651	81	S	S
53 GENERAL MERCHANDISE STORES	331	32201	45	S	S
54 FOOD STORES	3607	61674	225	S	S
55 AUTOMOTIVE DEALERS & SERVICE ST.	3371	31163	245	S	S
56 APPAREL AND ACCESSORY STORES	2929	31385	137	S	S
57 FURNITURE AND HOMEFURNISHINGS S	2124	17540	174	S	S
58 EATING AND DRINKING PLACES	10126	114819	348	S	S
59 MISCELLANEOUS RETAIL	7027	51669	267	S	S
60 DEPOSITORY INSTITUTIONS	1273	36075	181	S	S
64 INSURANCE AGENTS, BROKERS, & SER	2149	17532	191	S	S
65 REAL ESTATE	4852	24749	245	S	S
67 HOLDING AND OTHER INVESTMENT OI	81	917	17	S	S
70 HOTELS AND OTHER LODGING PLACES	375	12025	53	S	S
72 PERSONAL SERVICES	4741	22035	268	S	S
73 BUSINESS SERVICES	9693	157433	282	S	S
75 AUTO REPAIR, SERVICES, AND PARKIN	3835	17983	243	S	S
76 MISCELLANEOUS REPAIR SERVICES	1049	6347	133	S	S
78 MOTION PICTURES	304	2129	59	S	S
80 HEALTH SERVICES	12220	111733	281	S	S
81 LEGAL SERVICES	4449	28120	233	S	S
83 SOCIAL SERVICES	1318	22934	139	S	S
88 PRIVATE HOUSEHOLDS	3220	3475	196	S	S
89 SERVICES, NEC	104	288	23	S	S
92 JUSTICE, PUBLIC ORDER, AND SAFETY	29	186	6	S	S
20 FOOD AND KINDRED PRODUCTS	73	4767	11	S/B	S
25 FURNITURE AND FIXTURES	60	1935	9	S/B	S
27 PRINTING AND PUBLISHING	1109	17569	141	S/B	S
48 COMMUNICATION	300	30371	42	S/B	S
61 NONDEPOSITORY INSTITUTIONS	253	5049	42	S/B	S
79 AMUSEMENT & RECREATION SERVICE	1380	25391	186	S/B	S
82 EDUCATIONAL SERVICES	305	6051	48	S/B	S
86 MEMBERSHIP ORGANIZATIONS	846	8296	82	S/B	S
87 ENGINEERING & MANAGEMENT SERVI	7820	79565	292	S/B	S

Table 2a: Service to Total Employment					Table 2b: 1994 Employment and Population		
County		Average 93 employment by SIC			Employment Total (*)	Population	
Code	Name	Basic	Service	Total		1993	1994
3	Bergen	63,817	154,647	218,465	375,717	835,396	838,457
13	Essex	65,260	142,038	207,297	287,229	771,012	765,277
17	Hudson	62,369	81,367	143,736	192,322	550,947	550,029
19	Hunterdon	908	11,559	12,467	33,060	113,660	115,221
21	Mercer	10,844	73,136	83,980	134,568	328,368	328,837
23	Middlesex	67,206	140,118	207,324	302,723	685,404	690,810
25	Monmouth	10,522	94,930	105,451	175,765	571,094	577,126
27	Morris	29,217	97,671	126,888	208,446	431,656	438,017
29	Ocean	5,377	67,147	72,523	99,196	450,326	457,700
31	Passaic	34,873	70,216	105,089	155,388	475,147	477,098
35	Somerset	16,320	57,053	73,373	135,686	255,146	260,101
37	Sussex	532	9,913	10,445	26,427	136,235	137,821
39	Union	33,826	82,498	116,324	203,968	493,981	495,379
41	Warren	1,585	7,039	8,624	27,982	94,303	95,357
	Total	402,656	1,089,332	1,491,988	2,358,477	6,192,675	6,227,230

Sector to total ratio: 26.99% 73.01%
 Estimated service employment (1994) = 1,721,974
 Population to total employment ratio = 2.64036071
 Service employment to population ratio = 0.27652332

Note: (*) Estimated from the numbers of employees with unemployment insurance