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Effects of ITS on Transit System Cost Structures

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Table of Content

List of Tables

List of Figures

1 Introduction

The operation of public transit system has undergone significant changes over the past five decades. In the 1960s, most U.S. transit systems were privately owned and received little federal assistance. Since then government financial support for public transport has grown. This paper examines the cost structure of selected public transit systems that have installed and utilized Intelligent Transportation Systems (ITS) technologies for transit or transit ITS over time. The cost analysis will help to identify the effect of transit ITS on operating costs and the policy implications for federal programs that help transit agencies to improve their services more effectively.

The nature of ITS deployment is an important consideration in the transit industry for both policy makers and firms. Most transit systems in the United States are currently owned publicly and generally operated by city, county, or statewide agencies. The results of this analysis can characterize cost functions of transit systems that have deployed ITS technologies, and provide insights into how they can be used most effectively.

The study reviews the trends of capital expenditure and operating costs incurred by individual clusters of public agencies and estimates the service and cost efficiencies achieved by each cluster over time. The results of the analysis are used to evaluate the type and intensity of transit ITS technologies that may promote improved cost and service over time given a transit agencies operational characteristics. The following section outlines recommendations for federal programs and transit agencies based on the conclusions of this study. The next section discusses the methodology used and the empirical results. The final section discusses the policy implications of the results obtained from the analysis.

2 Recommendations

The analysis has several implications for policy and transit agency investments and operations. In general, the results reveal a need for good management and good planning in conjunction with transit ITS technology deployment. When an agency decides to make a capital investment in a technology, it is important that they are fully informed about good practices in operating the technology so they can quickly reap the benefits. There should be best practices reports for transit ITS operations for each of the technologies, so that they can learn from the places that know how to make the technologies work, rather than repeating mistakes that other agencies have already made. Table 1 summarizes the general conclusions and implications for federal programs and local transit agencies.

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[1] Karlaftis, M.G. and McCarthy, P. Cost Structures of Public Transit Systems: A Panel Data Analysis, Transportation Research Part E 38 (2002) page 1-18.

[2] Federal Transit Administration, Federal Highway Administration, "Advanced Public Transportation Systems Deployment in the United States" 2000 Update Final Report February 2002, FTA-MA-26-7007-02.1, DOT-VNTSC-FTA-02

Table 1: Summary of General Conclusions and Policy Implications

Conclusion	Implication
Operating costs rose over the period that transit ITS was being deployed. The average real operating costs for most clusters show a slight upward trend. The cluster with most intensive use of ITS might be starting a downward trend in 1999.	Transit agencies should be educated about the possibility of rising operational costs with the adoption of ITS technologies, so that they can plan for these costs.
There may be a learning curve associated with deployment of ITS technologies so that operational cost savings do not occur for several years after the initial capital investment.	Transit agencies should be informed about available training opportunities for different technologies, so the learning period could be shortened. Additional training should be developed for technologies that are not already well covered.
Choosing combinations of technologies carefully can improve cost outcomes. Transit information technologies should be used in conjunction with other technologies.	An optimum combination of different transit ITS technologies may be effectively used to improve service as well as cost efficiencies of transit agencies. Federal funds can be directed to the programs that help transit agencies identify their needs and select the best combination of available technologies to improve their performances.
Economies of scale influence the cost efficiencies of transit systems, but the more that ITS technologies are used, the less scale affects operating costs, and the more the number of employees and fuel use matter.	Service expansion by transit agencies using ITS requires less of an increase in operating costs than service expansion by agencies not using ITS.

3 Methodology and results

3.1 Methodology

This paper is based on a similar approach developed by Karlaftis and McCarthy.[3] First, we develop a cross-sectional dataset composed of 324 transit systems – 153 in the 78 largest metropolitan areas and 171 in the remainder of the United States, which are included in the Federal Transit Administration's study titled "Advanced Public Transportation Systems Deployment in the United States".[4] These transit agencies have deployed or planned to deploy advanced public transportation systems (APTS) such as advanced communication, automatic vehicle location, vehicle probes, automatic passenger counters, vehicle component monitoring, automated operations software, automated transit information, automated fare payment, and traffic signal priorities. After identifying the transit agencies that are users of ITS technologies, we combined the deployment data with operating data from Federal Transit Administration's National Transit Database (NTD) to examine the cross-section as well as temporal characteristics of these transit systems from 1995 through 2000. We use cluster analysis to classify transit systems into homogeneous groups based on their intensity of technology use. We then develop separate cost function models for each group of transit systems. This two-step process essentially minimizes size related biases that can skew individual groups towards the most "influential" member of the group. Further more, this process allows us to capture the operating characteristics of transit systems over time.

The APTS principally include nine elements – advanced communications, automatic vehicle location, vehicle probes, automatic passenger counters, vehicle component monitoring, automated operations software, automated transit information, automated fare payment, and traffic signal priority. We further classified these nine elements into three broad groups comprising vehicle management (M), transit information (I), and vehicle planning (P). Table 2 summarizes the elements of each of the three broad groups of transit ITS technology.

[3] Karlaftis, M.G. and McCarthy, P. Cost Structures of Public Transit Systems: A Panel Data Analysis, Transportation Research Part E 38 (2002) page 1-18.
[4] Federal Transit Administration, Federal Highway Administration, "Advanced Public Transportation Systems Deployment in the United States" 2000 Update Final Report February 2002, FTA-MA-26-7007-02.1, DOT-VNTSC-FTA-02

Table 2: Classification of transit ITS technologies

Vehicle Management (M)	Transit Information (I)	Vehicle Planning (P)
• Advanced communication • Automated vehicle location • Vehicle Probes • Vehicle component monitoring • Traffic signal priority	Automated transit information for • Pre-trip • Terminal/wayside • In-vehicle system	• Automated passenger counter • Automated operation software • Automated fare payment

We have used the k-means clustering method to divide the transit agencies into six homogeneous clusters, based on their use of the technology groups into three broad groups, M, I, and P. The k-means clustering allows one to iteratively improve an initial partition by minimizing with-group inertia. At each iteration, the algorithm calculates the centroids of the clusters in the current partition, then assigns each observation (transit agency) to the nearest centroid in order to form a new partition whose within group partition is lower than the previous one. The algorithm used here ensures that all clusters contain at least one observation. This method does not ensure that the solution at convergence is the optimal solution, but simply provides a first order approximation, or a heuristic solution. The resulting clustering based on the three groups of transit ITS technologies is summarized in the Table 3.

Table 3: Distribution of Transit Agencies Based on transit ITS Uses

Cluster	Transit Agencies	Vehicle Management (M)	Transit Information (I)	Vehicle Planning (P)
1- low use MP	65 (6)	Some*	No	Some**
2 – MIP	164 (99)	Yes	Yes	Yes
3 – IP	11 (6)	No	Yes	Yes
4 – MI	24 (8)	Yes	Yes	No
5 – MP	37(7)	Yes	No	Yes
6 – I	23 (8)	No	Yes	No
Total	324 (134)			

Note: Numbers in parentheses indicate transit agencies located in the 78 metropolitan areas.
*About 43% are using vehicle management tools; **about 30% are using vehicle planning tools.

To minimize the economies of scale and density related biases, the analysis does not explicitly use variables that indicate metropolitan areas or rural area transit systems. Clusters 2 through 6 use different combinations of the three technology categories. Cluster 2 (MIP) groups agencies that are the most intense users of transit ITS. Cluster 1 (low MP) includes agencies that either use some vehicle management or vehicle planning technologies, but not both. The difference between clusters 6 (I) and 1 (low MP) is that in cluster 6, all 23 agencies have deployed some kind of transit information system and in cluster 1 none use that. Over ninety percent of the transit systems in cluster 1 are rural systems whereas two-thirds of cluster 6 systems are rural. The difference between clusters 5 and 1 is the intensity of using vehicle management and vehicle planning technologies.

The most intense users of technologies (cluster 2) are also large agencies with a mean operating income of $100 million in 2000 and an average of 252 employees. Note that the transit agencies are not grouped according to their sizes, therefore, each cluster contains a wide variety of transit agencies (in size and scale of operation), but homogeneous in terms of their use of transit ITS technologies. The coefficient of variation (CV) shows the dispersion of the transit agencies (by operating fund size) in each cluster as well as across the clusters. Table 4 summarizes the characteristics of the average transit agency in each cluster based on 2000 data.

Table 4: Characteristics of An Average Transit Agency in Each Cluster

Cluster	**Number of Agencies**	**Operating Funds (million $)**		**Pass. Miles (million miles)**	
		Mean	CV*	Mean	CV*
1 - low use MP	65	5.9	1.7	10.7	2.3
2 – MIP	164	100.5	3.1	154.7	2.3
3 – IP	11	18.7	2.2	32.6	2.3
4 – MI	24	8.5	2.0	24.7	2.5
5 – MP	37	28.8	4.5	53.7	4.7
6 – I	23	4.8	1.5	15	2.3

*CV= standard deviation/mean.

Note that we do not have any clusters where agencies use only vehicle planning or vehicle management technologies. Automated transit information is the only group of technologies that are used as stand-alone by the agencies. Given this clustering of 324 transit agencies into six homogeneous groups, we developed a panel data set that consists of cross-sectional as well as time series information for a total of 250 transit agencies over a 6-year period of time (1995-2000). These are the transit agencies for which data were available from the NTD consistently for the past six years.

In microeconomic theory, the duality that exists between firm technology and costs entails that a firm's cost function summarizes all of the economically relevant information embodied in its production function. Therefore, the analysis of the panel data set would indicate characteristics and trends in variable as well capital costs used by the transit agencies in each cluster as well as federal funds obtained by the agencies during this period of time. Although we do not have information on the specific year agencies have deployed their transit ITS technologies, we believe transit agencies deployed transit ITS technologies widely since the mid-1990s although some of the larger agencies may have started their use in the early1990s.

Table 5 presents the number of transit systems in each cluster for each year. The analysis used 1,500 observations or data points. The Appendix lists the transit agency names and the associated clusters in detail.

Table 5: Distribution of Observations by Clusters over Time

Cluster	1995 -2000	Total
1-Low MP	39	234
2- MIP	143	858
3-IP	10	60
4-MI	18	108
5-MP	27	162
6-I	13	78
Total	250	1,500

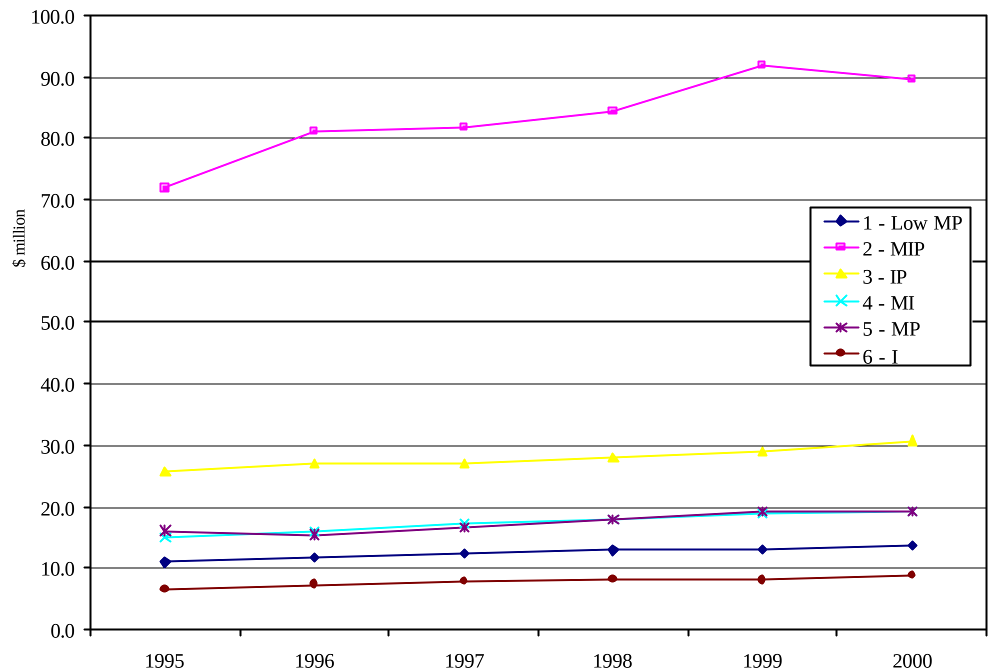
We develop separate cost function models for each group of transit systems. This two-step system potentially minimizes the size related biases and can capture the trend in cost functions and operational characteristics of each group of transit systems. In the long run, transit agencies are assumed to minimize costs with respect to all inputs, or at least minimize costs with regard to a subset of inputs and conditional on the levels of the fixed inputs. In general transit agencies can adjust most of their inputs fully within three to five years, although this may be questionable for rail tracks and in situations where there are regulations affecting service provision. The six-year time series data on transit agencies operating characteristics shows the long-term trend for each of the cluster.

3.2 Capital costs, operating costs and efficiency

We define the operating cost incurred by each transit agency as the summation of operator and other salaries paid by the agency, vehicle maintenance cost and vehicle operating costs. Figure 1 below illustrates the median operating costs in real terms[5] incurred by transit agencies in each cluster.

[5] Nominal variable costs are adjusted for real dollar by using consumer price index research series using current methods (CPI-U-RS) for U.S. city average for all items published by the U.S. Bureau of Labor Statistics, (1977 =100) http://www.bls.gov/CPI/CPIURSTX.htm

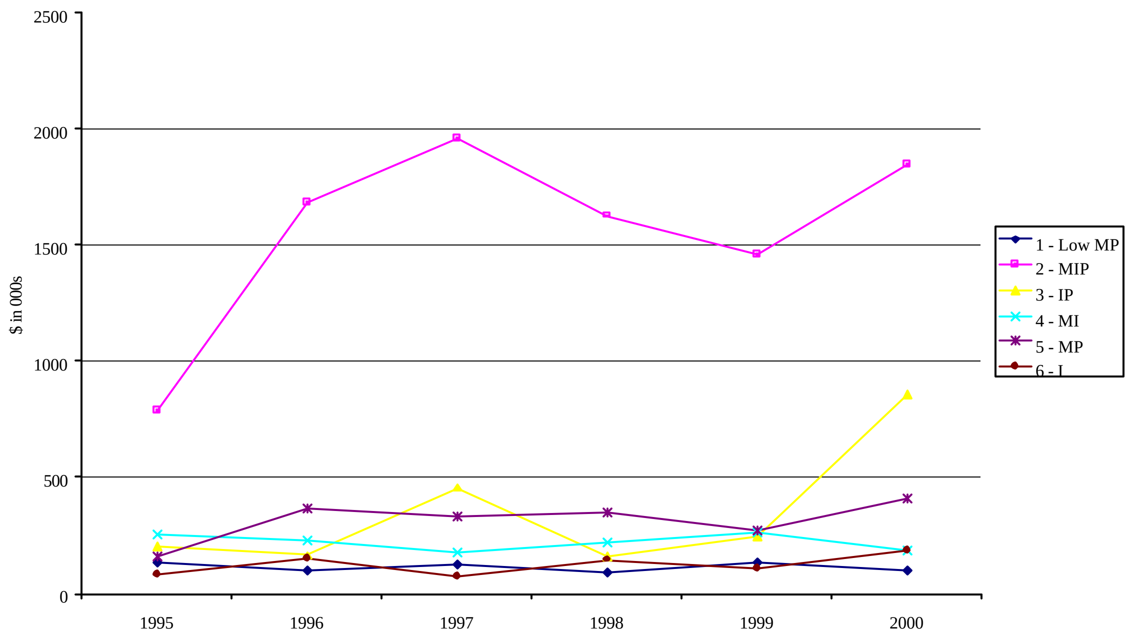
Figure 1: Trends in Median Operating Costs (in real $) by Clusters



As seen in Figure 1, the Cluster 2 - MIP transit agencies are substantially larger in operating costs as compared to the rest of the groups. The median operating (real) costs continued to increase throughout the past six years, but may approach a downward trend beginning in 1999. Although operating costs jumped 10 percent between 1995 and 1996, the rate of growth stabilized over time for Cluster 2 – MIP agencies. The average operating (real) costs for all other clusters are fairly stable over the past six years, with a slight upward trend.

Figure 2 illustrates the trends in capital use by transit agencies. As expected, median capital expenses by Cluster 2 (MIP) transit agencies are substantially higher than the rest of the agencies. Capital expenditures peaked in 1997 for Cluster 2 agencies and stayed fairly high through 2000. This may be due to the fact that larger transit agencies in this group were more likely to deploy transit ITS technologies earlier (in 1995 –1997) and then build out their systems. For the smaller agencies in Clusters 1 (low MP) and 6 (I), capital expenditure remained consistent throughout the six years, i.e., the relatively low costs of transit ITS technologies used by these agencies were quite insignificant in their overall budget. Capital expenditures, however, jumped for Cluster 3 (IP) agencies that are predominantly small transit agencies. Without more recent data on ITS deployment, it is not possible to determine whether the increased expenditures were for ITS technologies or for capital infrastructure projects, such as rail tracks, or bus terminals. In 2000, these agencies are users of automated transit information systems as well as vehicle planning tools such as automated passenger counters, automated operations software and automated fare payment systems. Cluster 5 (MP) showed a sustained increase in capital expenditures during the time period.

Figure 2: Trends in Median Capital Expenses incurred by Transit Agencies



In general, economies of scale influence the cost efficiencies of transit systems but not service efficiencies. We define cost efficiencies as operating expenses per passenger mile and service efficiencies as operating costs per vehicle mile. Figure 3 illustrates the trends in cost efficiencies by clusters. Figure 4 shows trends in service efficiencies by clusters. As expected with their economies of scale, Cluster 2 transit systems (MIP) are most cost efficient through most of the analysis period. Scale is not the only determinant, however, as the smallest systems in Clusters 6 (I) and 1 (Low MP) are more cost efficient than the larger agencies in Cluster 4. Cluster 1 (Low MP) is the only cluster to show a decline in operating costs per vehicle mile over the analysis period.

Figure 3: Trends in Cost Efficiencies by Clusters over Time

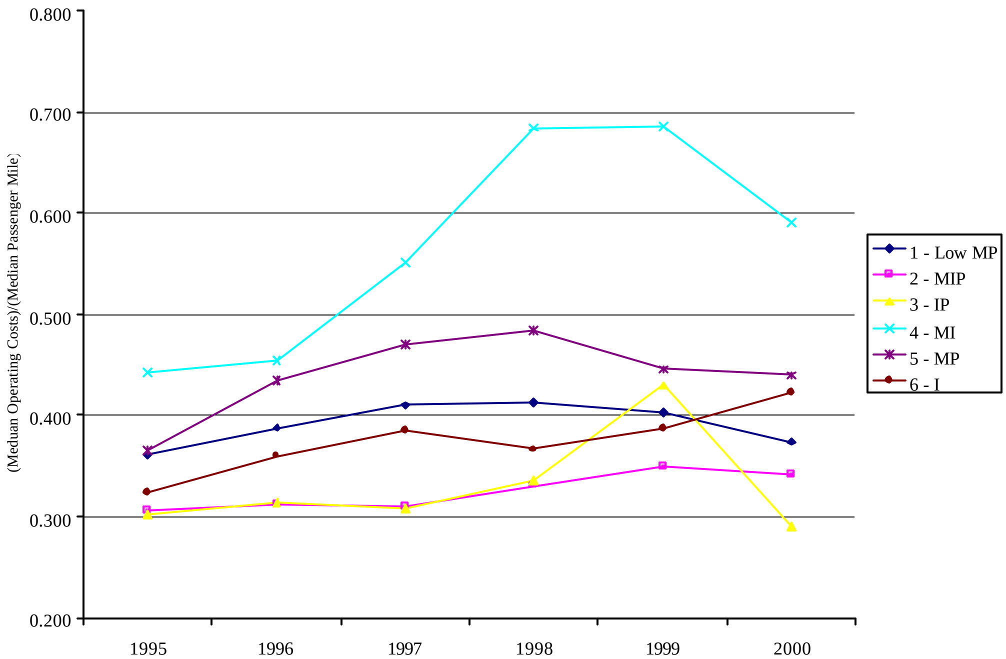
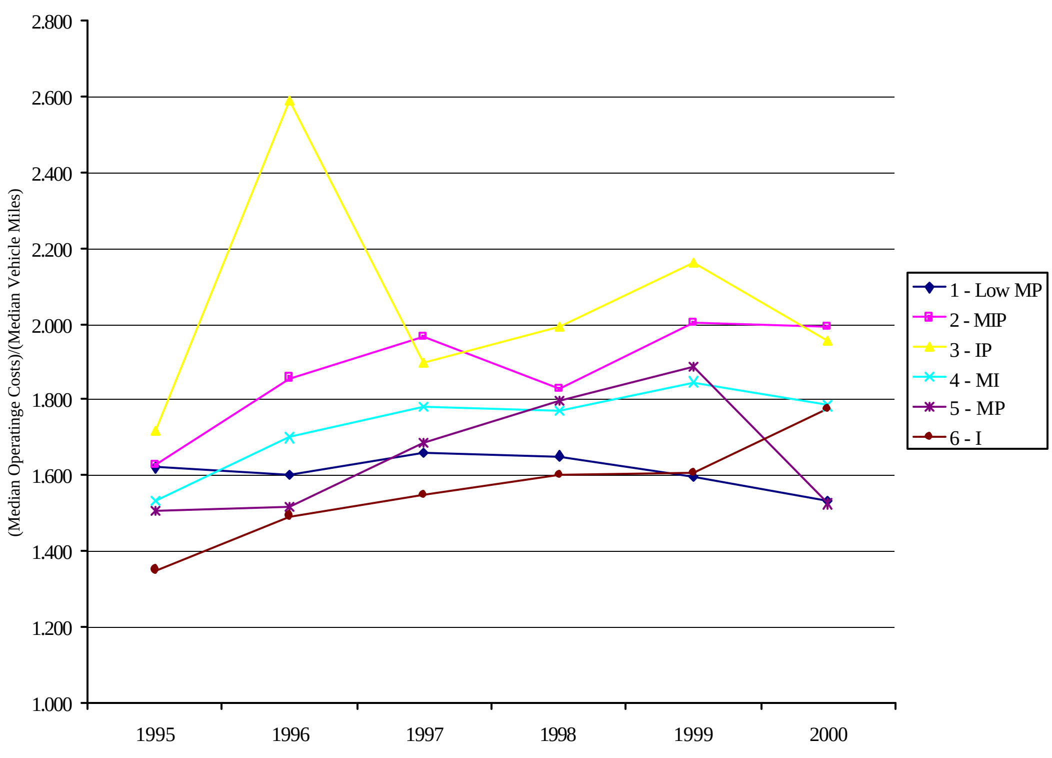


Figure 4: Trends in Service Efficiencies by Clusters over Time



Technologies affect cost efficiency. The Cluster 4 (MI) agencies, which are users of vehicle management tools and automated transit information systems, incurred the highest operating costs per passenger mile, rising sharply over much of the time period. The vehicle management tool expenditures in this group were primarily for advanced communications, rather than AVL. The other cluster with transit information systems, but no vehicle planning technologies, Cluster 6 (I), shows a similar steep rise in operating costs per passenger mile.

It appears that ITS technology implementation has a learning curve delaying improvements in cost efficiency from capital investments. Cluster 5 (MP) transit agencies may be achieving cost efficiencies that come with technology deployment with a lag. About two thirds of these agencies deployed AVL during the analysis period in addition to advanced communications. Likewise, a learning curve may have an influence on the cost efficiencies achieved by the Cluster 3 (IP) agencies, which deployed automated transit information tools and vehicle planning tools. This group incurred substantially high capital costs in 1997, possibly reflecting a large number of transit agencies deploying transit ITS technologies during this time period. The operating costs remained stable enough to improve the cost and service performances in 2000.

Choosing technologies carefully can improve cost outcomes. For Cluster 3 (IP) agencies, which are small urban transit agencies, vehicle management tools such as automated vehicle location or vehicle probes may be redundant. Their cost per vehicle mile has risen over the time period, but this cluster is the only one where costs per passenger mile have dropped. Some of the Cluster 5 (MP) agencies (second largest group in terms of operating funds) may, however, be better off adding automated transit information systems to their portfolio of vehicle management and planning tools to achieve the cost efficiency of Cluster 2 (MIP) agencies. While the Cluster 5 (MP) agencies have outperformed the Cluster 2 (MIP) agencies based on their trends in costs per vehicle mile, on a per passenger mile basis Cluster 2 (MIP) costs have only risen slightly over time, while Cluster 5 (MP) costs are noticeably above where they started in 1995.

3.3 Cost Functions

Since operating cost plays an important role in determining the cost and service performance of transit agencies, we use a translog statistical function to approximate a transit system's operating costs. The use of the translog function is fairly common in the recent cost function literature. The translog cost function is a second order approximation of the cost function around its mean value. The variable cost of a transit agency is expected to be dependent on the amount of fuel used, number of employees in the agency, and the annual vehicle miles. In general, it is difficult to explicitly specify all the explanatory variables that affect the dependent variable, variable costs. The omitted or unobservable variables are summarized in the error disturbances. We use the Fuller-Battese method to add the individual and time-specific random effects to the error disturbances, and the parameters are then efficiently estimated using the GLS method. The use of the Fuller-Battese method deals with the problem of heteroskedasticity, that of transit agency specific disturbances, and that of correlation of the error term with the lagged dependent variable. The results of the parameter estimates are listed in Table 6.

Table 6: Translog Cost Functions dependent variable: Variable costs

	Model	**Low MP**	**MIP**	**IP**	**MI**	**MP**	**I**
Variable	Pooled	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Intercept	4.9	2.82	5.37	2.89	2.80	3.57	2.01
Fuel	0.26	0.12	0.21	0.83(ns)	0.09(ns)	0.23	0.48
Number of Employees	0.35	0.13	0.43	0.62	0.28	0.44	0.20(ns)
Vehicle Miles	0.13	.60	.09	0.31	0.53	0.26	0.41
Degrees of Freedom	1495	39	143	10	18	27	13
System R-squares	.56	.80	.54	.95	.77	.84	.82
Hausman Test for random effects	139.98	84.02	81.75	-	13.6*	6.95*	17.21*

* Could not reject null-hypothesis that there is contemporaneous correlation between the error term and the dependent variable at the 99% confidence level.

Note: Unless otherwise noted all variables are significant at 95% confidence level.

Table 6 reveals that for the pooled sample of cross-sectional and time series data for 250 transit agencies, operating costs depend significantly on gallons of fuel used, number of employees and passenger miles. The cost elasticity of vehicle miles is 0.13, whereas the cost elasticities of fuel and employee are 0.26 and 0.35 respectively. The more that ITS technologies are used, the less scale affects operating costs, and the more the number of employees and fuel use matter. Therefore technology can magnify the effect of good or poor management practices if vehicle miles reflect service provided. For operation of transit ITS technologies, transit agencies may incur higher operating costs to include relatively higher paid skilled personnel to operate the systems, such as maintaining computer software.

4 Conclusion

This study classifies transit agencies according to their transit ITS use. The trend in operating expenses and capital expenses, along with their annual passenger and vehicle miles provides insight into the service performance as well as cost efficiencies of each group.
The major conclusions of the analysis are as follows:

- Operating costs rose over the period that transit ITS was being deployed. The average real operating costs for most clusters show a slight upward trend. Cluster 2 (MIP) might be starting a downward trend in 1999.
- Choosing combinations of technologies carefully can improve cost outcomes. Transit information technologies should be used in conjunction with other technologies.
- There may be a learning curve associated with deployment of ITS technologies so that operational cost savings do not occur for several years after the initial capital investment.
- Economies of scale influence the cost efficiencies of transit systems, but the more that ITS technologies are used, the less scale affects operating costs, and the more the number of employees and fuel use matter.

Essentially, what this report argues for is good management and good planning with respect to the technologies. When an agency decides to make a capital investment in a technology, they should be fully informed about good practices in operating the technology so they can quickly reap the benefits. There should be best practices reports for transit ITS operations for each of the technologies, so that they can learn from the places that know how to make the technologies work, rather than repeating mistakes that other agencies have already made.

5 Appendix

List of Transit Agencies in the used in the Study

Transit ID	Agency Name	City	State	Metro?	Cluster	Area Served	Population
0006	Yakima Transit	Yakima	WA		1	20	71845
0011	Boise Urban Stages	Boise	ID		1	64.5	148600
0018	Ben Franklin Transit	Richland	WA		1	110	160800
0022	Pocatello Regional Trans	Pocatello	ID		1	31	53392
1002	Manchester Transit Auth	Manchester	NH		1	47	114918
1005	Lowell Regional Transit	Lowell	MA		1	265.569	264280
1066	Chittenden Cty Trans Auth	Burlington	VT		1	60.7	81000
1088	Casco Bay Island TD	Portland	ME		1	73	120220
1107	Milford Transit District	Milford	CT		1	155	368061
2003	Broome County Dept of PW	Vestal	NY		1	712	165000
2006	City of Long Beach	Long Beach	NY	yes	1	5	35000
2085	Clarkstown Mini-Trans	Nanuet	NY	yes	1	179.389	265475
2126	Hudson Transit Lines	Newark	NJ	yes	1	2898	5443000
2135	Monsey New Square Trails	Spring Valley	NY	yes	1	176	286573
2136	Queens Surface Corp	Flushing	NY	yes	1	112	1952000
2163	Lakeland Bus Lines, Inc.	Newark	NJ		1	2898	5443
2169	New York-Trans-Bridge	Newark	NJ		1	2898	5443
3002	Tri-State Transit Auth	Huntington	WV		1	60	86354
3006	Greater Richmond Transit	Richmond	VA	yes	1	374.2	589980
3014	Harrisburg-Capital Area	Harrisburg	PA	yes	1	136.5	292904
3050	G G & C Bus Company	Washington	PA	yes	1	33	61634
3054	Centre Area Transp Auth	State College	PA		1	132.69	86708
3071	City of Alexandria	Alexandria	VA		1	945	3363031
3072	Frederick County Transit	Frederick	MD	yes	1	663	199369
3074	Harford County Transp Svc	Abingdon	MD	Yes	1	133	184221
4007	Capital Area Transit	Raleigh	NC	yes	1	96.9	280100
4019	TA - Northern Kentucky	Fort Wright	KY		1	114.2	230077
4021	Albany Transit System	Albany	GA		1	17	87223
4025	Chatham Area Transit Auth	Savannah	GA		1	431.49	209167
4026	Manatee Cnty Area Transit	Bradenton	FL		1	747	253207
4036	City of Tallahassee	Tallahassee	FL		1	98	147490
4038	Escambia Cnty Area Trans	Pensacola	FL		1	160.2	261647
4047	Athens Transit System	Athens	GA		1	46	85000
4053	Greenville Transit Auth	Greenville	SC	yes	1	148	320167
4054	Johnson City Transit	Johnson City	TN		1	32.6	49381
4057	Jackson Transit Authority	Jackson	TN		1	40.369	52810
4071	Huntsville DOT	Huntsville	AL		1	168	180315
4080	City of Kingsport	Kingsport	TN		1	2.1	10708
4082	Douglas County Rideshare	Douglasville	GA		1	201	92000
4085	Bay Cnty Council on Aging	Panama City	FL		1	78.5	122901
4101	Spartanburg Transit Sys	Spartanburg	SC	yes	1	40	70000
4104	Indian River County COA	Vero Beach	FL		1	543	109000
5002	Green Bay Transit	Green Bay	WI		1	60.2999	151408
5019	Middletown Transit System	Middletown	OH		1	20	49490
5022	Toledo Area RTA	Toledo	OH	yes	1	149.3	417624
5052	South Bend Public Transp	South Bend	IN		1	68	154346
5058	Rockford MTD	Rockford	IL		1	85	185000
5097	Campus Bus Service	Kent	OH	yes	1	943	670000
5109	Beloit Transit System	Beloit	WI		1	16.329	35573
5145	City of Kokomo	Kokomo	IN		1	110	65000
6001	Amarillo City Transit	Amarillo	TX		1	25.6	95869
6018	Tulsa Transit Authority	Tulsa	OK		1	184	367302
6037	City of San Angelo	San Angelo	TX		1	49	90467
6041	Handitran Special Transit	Arlington	TX		1	98.7	315294
6049	Las Cruces Area Transit	Las Cruces	NM		1	57	62126
7019	University of Iowa	Iowa City	IA		1	30	71372
8002	Sioux Falls Transit	Sioux Falls	SD		1	57	127900
8004	Billings Metro Transit	Billings	MT		1	31.8	81151
8009	Missoula Urban Transport	Missoula	MT		1	36.279	65930
8010	City of Greeley-The Bus	Greeley	CO	yes	1	43	86444
8012	Great Falls Transit Dist	Great Falls	MT		1	20	63506
8014	Rapid Transit System	Rapid City	SD		1	34.2	54523

Transit ID	Agency Name	City	State	Metro?	Cluster	Area Served	Population
9006	Santa Cruz Metro Transit	Santa Cruz	CA	yes	1	446	252806
9024	La Mirada Transit	La Mirada	CA	yes	1	7.94	49918
9030	N San Diego Cnty Transit	Oceanside	CA	yes	1	403	805900
9031	Riverside Transit Agency	Riverside	CA		1	2500	1143163
9035	South Coast Area Transit	Oxnard	CA	yes	1	74.319	308461
9043	City of Commerce Muni Bus	Commerce	CA	yes	1	8	20359
9142	UNITRANS-Davis	Davis	CA		1	10.6099	52711
0002	Spokane Transit Authority	Spokane	WA		2	370.8	365660
0035	Washington State Ferries	Seattle	WA	yes	2	101.2	3190000
1057	Norwalk Transit District	Norwalk	CT	yes	2	45	102741
1089	Transit Express	Springfield	MA		2	302	551543
2004	Niagara Frontier TA	Buffalo	NY	yes	2	1575	1182165
2071	Huntington Area Transit	Huntington Stat	NY	yes	2	100	196000
2075	Port Authority Transit	Lindenwold	NJ	yes	2	323	743886
2082	New York City DOT	New York	NY	yes	2	322	7071639
2113	RGRTA & Lift Line	Rochester	NY	yes	2	659	716072
2128	Suburban Transit Corp	Newark	NJ	yes	2	2898	5443000
3001	Kanawha Valley RTA	Charleston	WV		2	908	231414
3027	York County TA	York	PA		2	25	104155
3036	Charlottesville Transit	Charlottesville	VA		2	27	67596
3075	Delaware Transit Corp	Dover	DE		2	213	450557
4009	Fayetteville Area System	Fayetteville	NC		2	60.7	125043
4017	TA Lexington-Fayette Cnty	Lexington	KY		2	74	214098
4018	Transit Auth - River City	Louisville	KY	yes	2	283	754956
4029	Broward Cnty Mass Transit	Pompano Beach	FL	yes	2	410	1337000
4030	Gainesville Regional TS	Gainesville	FL		2	72.6	140000
4051	Chapel Hill Transit	Chapel Hill	NC	yes	2	25	58748
4056	Pee Dee RTA	Florence	SC		2	74	123600
4063	Space Coast Area Transit	Cocoa	FL		2	427	489700
4086	Metropolitan Bus Auth	San Juan	PR		2	198	1221086
4097	St Lucie Council on Aging	Fort Pierce	FL		2	588	183000
5003	Kenosha Transit	Kenosha	WI	yes	2	21	88000
5006	Belle Urban System-Racine	Racine	WI	yes	2	27	112100
5024	Western Reserve TA	Youngstown	OH	yes	2	149	361627
5025	Duluth Transit Authority	Duluth	MN		2	143	122971
5028	St Cloud Metropln Transit	St. Cloud	MN		2	29.3	61657
5030	Battle Creek Transit	Battle Creek	MI		2	104	83400
5044	Fort Wayne PTC	Fort Wayne	IN		2	61	186588
5051	Greater Lafayette PTC	Lafayette	IN		2	32	108500
5057	Rock Island County MTD	Rock Island	IL		2	46	116658
5088	Sheboygan Transit System	Sheboygan	WI		2	20.9789	57316
5117	LAKETRAN	Grand River	OH	yes	2	294.88	227511
5132	Twin Cities Area Transp	Benton Harbor	MI		2	14	24700
6009	Laredo Municipal Transit	Laredo	TX		2	14.3	176000
6010	City Transit Mgmt Comp	Lubbock	TX		2	109	187906
6012	Waco Transit System	Waco	TX		2	90.68	103590
6032	RTA - Orleans & Jefferson	New Orleans	LA	Yes	2	75	480260
6051	Corpus Christi Regionl TA	Corpus Christi	TX		2	838	315000
6059	BVCAA-Brazos Transit Sys	Bryan	TX		2	62	107458
6082	Gulf Coast Center	Galveston	TX		2	2314	350034
7010	Des Moines Metro Transit	Des Moines	IA		2	167.65	325179
7013	Black Hawk Cnty Metro	Waterloo	IA		2	89	101000
7018	Iowa City Transit	Iowa City	IA		2	21.6999	59738
7032	St Joseph Transit Mgmt	St. Joseph	MO		2	48.5	73990
8005	Colorado Springs Transit	Colorado Sprin	CO		2	644	390000
8008	Grand Forks City Bus	Grand Forks	ND		2	14.449	49425
9002	City & County of Honolulu	Honolulu	HI		2	596	841600
9004	Golden Empire Transit Dst	Bakersfield	CA	yes	2	98	369417
9009	San Mateo Cnty TransitDst	San Carlos	CA	yes	2	97	737100
9016	GoldenGateBridge-Hwy&TD	San Francisco	CA		2	256	618900
9029	OMNITRANS-Riverside	San Bernardino	CA	yes	2	480	1200000
9062	Monterey-Salinas Transit	Monterey	CA	yes	2	110	270136
9086	Riverside Special Transp	Riverside	CA		2	79	259738
9140	Peoria Transit	Peoria	AZ	Yes	2	141	100000
9151	Southern Calif RR Auth	Los Angeles	CA	yes	2	1370	6830926
0005	Everett Transit	Everett	WA	yes	3	30	91488
0012	Municipality of Anchorage	Anchorage	AK		3	1910	230185
0019	Intercity Transit	Olympia	WA		3	89	207355
0020	Kitsap Transit	Bremerton	WA	yes	3	396	229700
0025	Salem Area MassTransDist	Salem	OR		3	70	160000
0029	Snohomish Cnty Transp BAC	Everett	WA	yes	3	1294	414200
0033	Senior Svc Snohomish Cnty	Mukilteo	WA		3	1294	399180
2008	New York City Transit	Brooklyn	NY	yes	3	322	7322000
2078	Metro North RR	New York	NY	yes	3	527.1	4484000

Transit ID	Agency Name	City	State	Metro?	Cluster	Area Served	Population
0001	King County DOT	Seattle	WA	yes	4	2134	1685000
0003	Pierce Transit	Tacoma	WA	yes	4	450	643690
0007	Lane Transit District	Eugene	OR		4	241.3	265504
0008	Tri-County Metro District	Portland	OR	yes	4	592.4	1221937
1001	RI Public Transit Auth	Providence	RI	yes	4	784	750000
1003	Mass Bay Transp Auth	Boston	MA	yes	4	1038	2602487
2002	Capital District TA	Albany	NY	yes	4	1760	678394
2007	Long Island Bus	Garden City	NY	yes	4	284.389	1321000
2122	Academy Lines	Newark	NJ	yes	4	2898	5443000
2147	New York-GTJC	Jamaica	NY		4	322	7071639
3019	SEPTA	Philadelphia	PA	yes	4	2174	3728909
3030	Washington-Metro	Washington	DC	yes	4	945	3363031
3083	Hampton Roads-HRTDC	Hampton	VA	yes	4	369	1210588
4002	Knoxville Transp Auth	Knoxville	TN	yes	4	97.7	162161
4003	Memphis Area TA	Memphis	TN	yes	4	341	710827
4008	Charlotte DOT	Charlotte	NC	yes	4	242	546500
4011	High Point Transit	High Point	NC	yes	4	50	79394
4022	Metro Atlanta RTA	Atlanta	GA	Yes	4	498	1354871
4027	Pinellas Suncoast Transit	Clearwater	FL	yes	4	209.4	833504
4034	Miami-Dade Transit Agency	Miami	FL	yes	4	285	1800000
4040	Jacksonville Transp Auth	Jacksonville	FL	yes	4	242	834337
4046	Sarasota County TA	Sarasota	FL	yes	4	159.2	278800
4087	Durham Area Transit	Durham	NC	yes	4	93	179000
5005	Madison Metro Transit	Madison	WI		4	60.1	219185
5008	Milwaukee Cnty Trans Sys	Milwaukee	WI	yes	4	243	990700
5010	Metro Regional Trans Auth	Akron	OH	yes	4	419.92	514990
5012	Southwest Ohio RTA	Cincinnati	OH	yes	4	262	707964
5015	Greater Cleveland RTA	Cleveland	OH	yes	4	458	1412140
5016	Central Ohio Transit Auth	Columbus	OH	yes	4	543	961437
5017	Miami Valley Regional TA	Dayton	OH	yes	4	274	573809
5027	Metro Transit	Minneapolis	MN	Yes	4	1105	2265788
5031	Suburban Mobility Auth RT	Detroit	MI	Yes	4	1108	3267830
5040	Ann Arbor Transp Auth	Ann Arbor	MI	Yes	4	70.5989	189205
5043	Metrop Evansville TS	Evansville	IN		4	40.599	126597
5045	Gary Public Transp Corp	Gary	IN		4	37.5	116646
5048	LCEOC	Hammond	IN	yes	4	919	604526
5050	Indianapolis Public Trans	Indianapolis	IN	yes	4	417	823424
5060	Champaign-Urbana MTD	Urbana	IL		4	30	115524
5066	Chicago Transit Authority	Chicago	IL	yes	4	355.5	3708773
5113	Pace, Suburban Bus Div	Arlington Heigh	IL	yes	4	1533	3892562
5119	City of Detroit DOT	Detroit	MI		4	144	1065567
6006	El Paso Mass Transit	El Paso	TX		4	250.9	627556
6008	MetroTransAuth HarrisCnty	Houston	TX	yes	4	1285	2632241
6011	VIA Metropolitan Transit	San Antonio	TX	yes	4	1231	1397718
6019	Sun Tran of Albuquerque	Albuquerque	NM	yes	4	123.69	398000
6033	Central AR Transit Auth	North Little Roc	AR	Yes	4	117.5	160350
6048	Capital Metro Transp Auth	Austin	TX	yes	4	572	604621
6056	Dallas Area RTA	Dallas	TX	yes	4	688.5	2030250
7002	Omaha Transit Authority	Omaha	NE	yes	4	174.5	484875
7005	Kansas City Area TA	Kansas City	MO	Yes	4	173.169	509356
7015	Wichita Transit	Wichita	KS	yes	4	120	304011
8001	Utah Transit Authority	Salt Lake City	UT	yes	4	1612	1513000
9008	Modesto Area Express	Modesto	CA		4	51.3998	458506
9010	Torrance Transit System	Torrance	CA	yes	4	102.7	606847
9012	San Joaquin RTD	Stockton	CA		4	1489	529300
9013	Santa Clara Valley TA	San Jose	CA	yes	4	326	1689900
9014	Alameda-Contra Costa TD	Oakland	CA		4	364	1409983
9015	Municipal Railway	San Francisco	CA		4	48.6	792049
9022	Norwalk Transit System	Norwalk	CA	yes	4	36.7	218955
9023	Long Beach Publ Transp	Long Beach	CA	yes	4	96.0498	573734
9026	San Diego Transit Corp	San Diego	CA	yes	4	271.4	1385247
9027	Fresno Area Express	Fresno	CA	yes	4	133	453388
9032	Phoenix Publ Transit Dept	Phoenix	AZ	yes	4	476	1350000
9033	City of Tucson	Tucson	AZ		4	242	503991
9034	Glendale Dial-A-Ride	Glendale	AZ	Yes	4	58.5	208000
9036	Orange County Transp Auth	Orange	CA		4	797	2828400
9078	Central Contra Costa TA	Concord	CA	yes	4	200	477000
9154	Los Angeles County Metro	Los Angeles	CA	yes	4	1423	8450001
0016	Community Urban Bus Svc	Longview	WA		5	21	46210
1014	Worcester Regional TA	Worcester	MA		5	136	282698
1055	New Haven-CT Transit	Hartford	CT	yes	5	456	683160
1056	Stamford-CT Transit	Hartford	CT	yes	5	89.1	243771
2010	Dutchess Cnty Mass Trans	Poughkeepsie	NY		5	805	259462
3007	Greater Roanoke Transit	Roanoke	VA		5	43	96000

Transit ID	Agency Name	City	State	Metro?	Cluster	Area Served	Population
3009	Petersburg Area Transit	Petersburg	VA	yes	5	7	37000
3035	Ohio Valley RTA	Wheeling	WV		5	27.4499	70257
3040	Annapolis Transportation	Annapolis	MD		5	20	50000
3042	Washington County TD	Hagerstown	MD		5	267	70206
3069	City of Danville	Danville	VA		5	44.1	53056
4004	Metropolitan Transit Auth	Nashville	TN	yes	5	484	573294
4005	Asheville Transit Auth	Asheville	NC		5	30.8889	64692
4015	City of Jackson Trans Sys	Jackson	MS		5	114	196637
4032	County of Volusia-VOTRAN	South Daytona	FL		5	1207	420431
4043	Mobile Transit Authority	Mobile	AL		5	83	237900
4044	Montgomery DemandResponse	Montgomery	AL		5	157.7	201568
4045	Tuscaloosa Cnty Pkg & TA	Tuscaloosa	AL		5	1340	150500
4092	Clarksville Transit Sys	Clarksville	TN		5	107	106059
5004	LaCrosse Municipal Trans	LaCrosse	WI		5	8.5	51000
5009	Oshkosh Transit System	Oshkosh	WI		5	22.1	63192
5021	Portage Area RTA	Kent	OH		5	492	142585
5029	Bay Metropolitan TA	Bay City	MI		5	447	111763
5037	Muskegon Area Transit Sys	Muskegon Heig	MI		5	527.3	170200
5047	Bloomington-Normal Public	Bloomington	IL		5	28.9	91995
5049					5	920	604526
5065	Pekin Municipal Bus Svc	Pekin	IL		5	129	242353
5110	Bloomington Public Transp	Bloomington	IN		5	12	60633
5131	Opportunity Enterprises	Valparaiso	IN	yes	5	400	130000
6024	Shreveport Area Transit	Shreveport	LA		5	54	251398
6026	City of Monroe	Monroe	LA		5	31	55000
6080	Terrebonne Parish	Houma	LA		5	35.7	56613
7003	Springfield Utilities	Springfield	MO		5	52	98941
7011	City of Dubuque	Dubuque	IA		5	24	60000
9017	City of Santa Rosa	Santa Rosa	CA		5	25.489	140000
9039	Culver City Municipal Bus	Culver City	CA	yes	5	25.52	191053
9135	Sun Cities Transit System	Sun City	AZ	yes	5	28	65899
9137	Surprise Dial-A-Ride TS	Surprise	AZ	yes	5	67	21442
0034	Rogue Valley Transit Dist	Medford	OR		6	158.5	122790
1042	Valley Transit District	Derby	CT		6	57.5989	82750
1047	New Britain Transp Co-A	Berlin	CT		6	54	143500
1048	Hartford-CT Transit	Hartford	CT	yes	6	936	1075000
1050	Greater Bridgeport TD	Bridgeport	CT		6	90.2998	282710
1052	New Britain Transp Co-B	Berlin	CT		6	27.1	60000
1069	Regional Transp Program	Portland	ME		6	875.19	228100
1095	Northeast Transp Comp	Waterbury	CT		6	58.3998	161886
1096	City of Bangor	Bangor	ME		6	71	61402
1098	Western Maine Transp Svcs	Mexico	ME		6	79	70000
2021	Utica Transit Authority	Utica	NY		6	45.5	117003
2040	New York Bus Tours, Inc.	Bronx	NY	yes	6	322	7071639
2155	Cumberland Cnty Off Aging	Bridgeton	NJ		6	128	138053
2159	Atlantic Paratrans	Staten Island	NY		6	617.9	14648000
2162	Lafayette-Greenville IBOA	Newark	NJ		6	2898	5443
2164	Leisure Line	Newark	NJ		6	2898	5443
2165	Olympia Trails Bus Co., Inc.	Newark	NJ		6	2898	5443
2166	Orange-Newark-Elizabeth	Newark	NJ		6	2898	5443
2167	South Orange Avenue IBOA	Newark	NJ		6	2898	5443
2168	New York-Trans-Hudson	Newark	NJ		6	2898	5443
3003	Mid-Ohio Valley TA	Parkersburg	WV		6	13.9	49910
3008	Greater Lynchburg Transit	Lynchburg	VA		6	72.1989	80846
3018	Red Rose Transit Auth	Lancaster	PA		6	952	420920
4001	Chattanooga Area RTA	Chattanooga	TN		6	144	152393
4006	Wilmington Transit Auth	Wilmington	NC		6	32	55530
4014	Mississippi Coast TA	Gulfport	MS		6	45	102834
4023	Augusta Richmond Co TD	Augusta	GA		6	25.709	118829
4024	Columbus Transit System	Columbus	GA		6	132	220698
4058	Rome Transit Department	Rome	GA		6	24	30326
4103	Wiregrass Transit Auth	Dothan	AL		6	93	58925
5001	Appleton-Valley Transit	Appleton	WI		6	116.5	160918
5011	Stark Area RTA	Canton	OH		6	566.9	374406
5035	Kalamazoo Metro Trans Sys	Kalamazoo	MI		6	70	143000
5053	Terre Haute Transit Utly	Terre Haute	IN		6	17.5	63931
5059	Springfield Mass Transit	Springfield	IL		6	65	126595
5091	Wausau Area Transit Sys	Wausau	WI		6	25.1	44475
5108	Janesville Transit System	Janesville	WI		6	27.9	59498
6013	Port Arthur Transit	Port Arthur	TX		6	38.7	56724
6016	Beaumont Transit System	Beaumont	TX		6	41.1498	82731
6068	Grand Prairie	Grand Prairie	TX	yes	6	80	118329
6087	Ryder/ATE	Houston	TX		6	1178	2457673
7001	StarTRAN	Lincoln	NE		6	84.5	215928