Transit Service Contracting and Cost-Efficiency

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Contracting out for services is a controversial issue in public transit. Proponents argue that contracting always saves money in comparison with public operation, whereas critics respond that cost savings through contracting are overstated and come almost exclusively at the expense of labor. In order to determine the medium-term effectiveness of contracting out transit services, the impacts of contracting on the cost per vehicle-hour of fixed-route bus services are examined. A national sample of operators is studied, including some that contract out none of their routes, others that contract out all of their routes, and some that contract out a portion of their service. The effects of contracting on costs are examined for the years between 1989 and 1993. The findings show that bus services operated under contract are sometimes, but not always, less costly than directly operated services. A regression model is used to test the influence of a variety of factors on cost per vehicle-hour, and contracting is found not to be the most significant variable influencing operating costs. The findings indicate that vehicle and labor use have far more influence on cost-efficiency than either wages or contracting arrangement. It is concluded that cost-efficiency can be achieved in many different ways, depending upon local conditions, and contracting should not be assumed to be the most appropriate strategy in every situation.

Transit contracting in the United States has grown since the 1980s. In 1985 less than 9 percent of revenue kilometers were provided under contracting arrangements (1). Furthermore, almost 60 percent of this mileage was in demand-responsive services, leaving only 2 percent of all fixed-route revenue kilometers provided under contract. By the late 1980s many more agencies had begun to contract some or all of their routes. The number of agencies that reported to FTA that they contract for fixed-route motorbus services increased by 27 percent between 1989 and 1993, from 93 to 118. The number of revenue hours of motorbus services under contract grew by 133 percent over the 5-year period and now makes up 5.8 percent of all fixed-route revenue hours (2,3).

A number of studies have looked into the effects of contracting on transit efficiency. Most looked at realized or potential cost savings, and the majority reported substantial savings over publicly operated routes. Proponents of contracting claim that public transit agencies are monopolies strongly influenced by labor unions and that they have few incentives to be efficient. They argue that introducing competition in public transit will allow market forces to determine appropriate wages for employees while providing more efficient service. Contracting opponents, on the other hand, assert that contracting is an attempt to turn back the clock on labor's gains to an era when employees worked long hours for little pay and few benefits.

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RECENT RESEARCH ON TRANSIT SERVICE CONTRACTING

FTA estimates that service contracting can produce cost savings of between 25 and 30 percent per unit of service provided (4). Some studies show much higher cost savings, in the range of 30 to 60 percent (5–12). A few others, in contrast, have seen contracting as having been far less successful.

A study commissioned by the Los Angeles County Transportation Commission analyzed the impacts of Southern California's experiment with a privately operated "transportation zone" (6–8). The Foothill Transit Zone was formed in 1988 by several San Gabriel Valley cities and Los Angeles County to take over several routes scheduled for service cuts by the Southern California Rapid Transit District (SCRTD). The study documented substantial subsidy reductions and patronage improvements but was criticized by SCRTD as being unfair in its assessment of inefficiencies on the part of the public operator. They subsequently hired Coopers & Lybrand to produce an equally controversial report finding virtually no cost savings by contracting out Foothill Transit's routes. Richmond critiqued both studies and concluded that Foothill Transit's savings probably range between 24 and 34 percent (11).

In 1988 the state of Colorado mandated that the Denver Regional Transportation District contract at least 20 percent of its service to private operators. A 2-year analysis revealed savings of 13 percent using a marginal cost analysis and 26 percent (excluding capital costs) to 31 percent (including capital costs) using fully allocated costs (13). Interestingly, the review revealed that the contractors providing the service made a profit of only 0.3 percent after 2 years of operation. Morlok and Viton cite cost savings from a number of international studies conducted in the late 1970s and early 1980s demonstrating that the cost of American, Australian, and English private carriers was between one-half and two-thirds of that of public carriers (5). Teal details a case in Yolo County, California, in which a private company took over service provided by Sacramento Rapid Transit, a public operator, and cost savings exceeded 35 percent (14).

Few reports dispute the claims of significant savings by contracting proponents. Sclar claims that Denver's contracting costs per revenue hour actually exceed the costs of the publicly operated routes (15). Sclar et al. also published the only comparative report that has disputed the savings credited to contracted services in the United States (16). They argue that privatization savings are grossly overstated and that contracting has produced losses in many cases. With New Orleans, New Jersey Transit, and Westchester County, New York, as examples, Sclar shows that private operator costs could exceed public provider costs. The report notes, however, that the operations examined were not competitively bid. Many researchers believe that in the cases where private costs exceed public costs,

these exceptions can be explained by the existence of a private monopoly in which there is a guaranteed subsidy to cover deficits (*5*). Thus, it appears to be the competitive aspects of contracting, and not private operation per se, that lead to cost savings.

Writing about transit privatization in Great Britain since 1986, Gómez-Ibáñez and Meyer caution that Britain's privatization effort produced complicated results, providing too rich a portfolio of lessons to draw simple conclusions about the impacts of privatization (*17*). Their research suggests, however, that British privatization has proved largely successful in a number of areas. Public subsidies to transit were reduced by nearly 25 percent in just 2 years, and by 1992 total subsidies for public bus operations outside London decreased by 56 percent mostly because of fare increases, declines in the cost of fuel, and a drop of more than 30 percent in unit operating costs (*18*). Long-time transit workers lost less than expected by allowing work rule changes in exchange for maintaining wage rates and substantial early retirement or buy-out programs. Because there have been service expansions, total transit employment has shown no net losses, but new employees face lower wage rates than their experienced coworkers. Debates over the extent and quality of service improvements due to privatization can be heated, but some customer-oriented innovations have come from Britain's privatization. Examples include using smaller vehicles for more frequent and faster service and suburb-to-suburb express services (*19*).

There is no doubt where most of the savings occur, because virtually every study shows that most savings come in reduced labor expenses. Richmond writes that contractor proposals for Foothill Transit showed wage rates "well under $10" compared with $14.69 for SCRTD drivers (*11*). After 4 years of employment, even the highest-paid contract drivers in Denver earned roughly 77 percent of the salary of Denver Regional Transportation District's drivers (*13*). When the Bay Area Rapid Transit District awarded a contract for express bus services in 1989, the only public agency to submit a bid, the Alameda-Contra Costa Transit District, proposed an hourly driver's rate of $11.01. In contrast, the highest private bidder proposed a wage rate of $9.10 per hour, and the lowest private bidder submitted a rate of $7.37 (*20*). Similar results hold for drivers in San Diego County, where, in 1994, a full-time public agency driver earned $15.69 per hour on average compared with $8.96 for the highest-paid contract driver (*21*). Finally, a study of wage differentials between public and private transit personnel in Houston found that operators and mechanics received much lower wages in the private sector than from the region's public operator (*22*). Houston Metro's bus drivers earned 83 percent higher wages on average than their private sector peers, whereas public-sector mechanics received over 31 percent more in wages than equivalent private-sector workers.

There is evidence that even the threat of privatization can induce labor to give concessions in exchange for job security. Talley studied the effects of contracted paratransit services in reducing motorbus operating costs in the Tidewater Transportation District Commission in Virginia (*23*). He found that once the agency initiated paratransit service, the Amalgamated Transit Union was willing to relax work rules to preserve job security. The Institute of Transportation Engineers presented a dozen case histories showing dramatic cost savings and "positive ripple effects" due to service contracting, such as lower unit costs and improved service (*4*). All of the cases presented by the Institute cited the improved position of management in labor negotiations, which resulted in lower costs to the public agency. Overall, the evidence suggests that savings due to relaxed work rules permitting better utilization of labor may be more significant than reductions in compensation rates.

Finally, there is evidence that public operators become more competitive themselves once contracting is initiated. The Los Angeles Department of Transportation contracts for all of its service and has been able to reduce operating costs on routes formerly run by the Metropolitan Transportation Authority. However, the Authority recently won a competitive bid to provide service on one of the city's routes (*24*). Hurwitz (*25*) and Bladikas (*4*) also report that formerly cost-inefficient public agencies have been able to compete successfully for some contracted routes.

The evidence to date strongly suggests that contracting produces immediate cost savings in the provision of transit services. However, the current body of research has two principal weaknesses. First, the cited studies typically only look at costs during brief periods of time following the initiation of contracting. Most of this research was conducted 1 to 2 years after contracting was initiated, with no follow-up investigations. It might be expected, for example, that increasing demand for private carriers might cause their costs to rise over time.

The second weakness is that most of the comparative research contrasts smaller single-service private companies with large multi-service transit authorities meeting a variety of regulatory, social, and political demands. An appropriate analysis would compare similarly sized agencies and, ideally, agencies with similar modal and service area compositions.

This study addresses these two weaknesses by empirically comparing cost-efficiency trends over a 5-year period. In addition, a multiple regression model is used to determine the factors that most contribute to operating efficiency. By comparing costs among agencies nationwide that contract for service with those that do not contract, conclusions may be drawn about the long-term impacts of contracting.

RESEARCH DESIGN AND METHODOLOGY

In order to determine the effects of service contracting on the cost-effectiveness of transit operations, three groups of transit operators were identified:

1. Public agencies or state departments of transportation contracting 100 percent of their fixed-route general public motorbus transit service over the entire 5-year study period,
2. Public agencies or state departments of transportation doing no contracting over the entire 5-year period, and
3. Public agencies or state departments of transportation contracting some portion of their total transit revenue hours.

These three classifications were chosen to test the hypothesis that contracting is inherently more cost-efficient than not contracting. If contracting is more cost-efficient, operators contracting all of their services will tend to be more efficient than those doing no contracting. Testing this hypothesis over a 5-year period lessened the impacts of short-term cost anomalies that occur when operators initiate contracting. The third classification—operators contracting a portion of their services—allows determination of whether the extent of contracting has a positive influence on system efficiency. For the group contracting some transit services, both operations performed in-house (i.e., directly operated services) and "purchased" or contracted operations were examined.

Operating cost-efficiency is the measure by which the three groups were compared. Some argue that cost-efficiency does not adequately address the full range of demands placed on transit providers (*26*).

Although there are different metrics by which transit service can be evaluated, such as service effectiveness (e.g., boardings per hour) and cost-effectiveness (e.g., subsidy per passenger), using cost-efficiency as the decision model for public transit agencies can be justified on two grounds. First, there is no evidence that transit managers allocate their resources any differently than other economic entities, public or private. The decision to contract is above all a cost-efficiency decision. This view is supported by a survey of transit operators in which 16 of 35 transit managers surveyed cited the cost saving potential of contracting as the major reason for initiating contracting (*27*). Second, service effectiveness depends on a demand for service that lies largely beyond the control of the agency. Even though actions of the agency may have an impact on effectiveness (e.g., restructuring routes or altering service frequencies), policies made by elected or appointed boards can hinder effective service provision.

Annual operating cost per revenue hour of service was used as the efficiency measure. Revenue hours in the denominator effectively normalizes service characteristics and operating conditions. Buses traveling congested streets at slower speeds take longer to cover the same distance as express commuter services operating on freeways (*28*). Thus, revenue hours removes regional and modal biases in producing transit service.

DATA SOURCES

The primary data source was the FTA National Transit Database for 1989 to 1993. FTA receives these data annually from operators receiving Section 9 operating grants in accordance with Section 15 of the Urban Mass Transportation Act of 1964.

This study also employed the American Chamber of Commerce Research Associates' composite cost-of-living index (COLI), which measures differences in the costs of consumer goods and services between urban areas. To establish the COLI, quarterly price data are collected in different cities for 59 items in six general areas: grocery items, housing, utilities, transportation, health care, and miscellaneous goods and services. This information is weighted and averaged, and a composite index figure is derived with 100 representing the national average. If a city has an index value of 115, it is 15 percent more expensive to live there than in the average American city (*29*).

It was also hypothesized that regions experiencing higher-than-normal levels of snow and rain may incur maintenance costs or accident levels not experienced by other operators. To ascertain the effects of weather on transit costs, the Environmental Research Laboratories' Climate Diagnostic Center databases were used (*30*). Thirty-year average annual precipitation and snowfall data from the Climate Diagnostics Center World Wide Web site were collected for every city in the data set.

Finally, to test the influence of union-friendly urban areas on cost-efficiency, general population unionization rates for 1990 were examined for metropolitan areas with operators from this sample. These 1990 rates were obtained from the Union Membership and Coverage Files developed by Hirsch and Macpherson at Florida State University (*31*). These data are based on monthly Current Population Surveys conducted by the U.S. Census Bureau. The data included generalized metropolitan area unionization rates since the data files do not include the occupational breakdown for the public transit industry by metropolitan area. Although these data do not reflect the impact of unionization on transit performance, they can serve as an indicator of the impact of an urban area's "union friend-liness." If the citizens of a metropolitan area value the benefits that unions bring to workers, high operating costs per unit of transit service may reflect that preference.

To be included in the data set, an operator must not have moved from one of the three classifications presented earlier to another over the entire period between 1989 and 1993. This ensured that the data set contained consistent longitudinal information for each operator. Another restriction was that each operator had to report all data for each year during the study period.

Section 15 requires that contract operators running more than a threshold number of peak vehicles must file a separate Section 15 report with FTA. In 1989 this threshold was 50 vehicles; since 1990 it has been 100 vehicles. Individual transit properties running a number of peak vehicles below this threshold are included with the contracting agency's own Section 15 report, whereas those exceeding the threshold number file a separate report. Thus, if an agency contracts out to four operators, each running fewer than 100 peak vehicles in 1993, data for the four would be reported together in the contracting agency's Section 15 report. If, for example, this agency were to contract with an additional operator running more than the 1993 threshold of 100 peak vehicles, the contracting agency would still file one aggregate report for the four small operators but would indicate in its report that a separate report would be filed by the one large contractor.

Before 1992 the nature of contractual relationships between contracting agencies and their contract operators was not explicitly reported, making it difficult to identify which contractors worked for a particular agency. As a result the data set does not include any agencies that contracted with operators whose size exceeded the FTA threshold. As a result, seven agencies were eliminated from the data set, five of which operate in major metropolitan areas (New York City Department of Transportation, New Jersey Transit Corporation, Dallas Area Rapid Transit, Westchester County Department of Public Works, and the City of Los Angeles Department of Transportation). Excluding these large agencies implies that the study may not fully represent the range of contracting experiences in the United States.

The final data set contained 142 operators providing general fixed-route motorbus transit services. This sample consists of 29 percent of all agencies reporting to FTA in 1993 and 35 percent of those reporting in 1989. Within the sample there are 55 operators contracting either some portion or all of their services, making up 47 percent of all operators reporting purchased transportation in 1993 and 55 percent reporting in 1989.

Over half of the operators for the study operated fewer than 25 peak vehicles. Slightly under 25 percent operated between 25 and 100 vehicles, and 20 percent ran over 100 peak vehicles. Only two operators, the Los Angeles County Metropolitan Transportation Authority and the Washington Metropolitan Area Transportation Authority, operated over 1,000 vehicles. Neither of these two operators contracts out any transit services, although the Los Angeles MTA provides contract services to the City of Los Angeles Department of Transportation. Most agencies that contract some of their services are mid-sized to large, operating between 100 and 1,000 vehicles. For small operators doing no contracting, the marginal cost of adding drivers and equipment is generally much lower than the overhead costs to procure and monitor contracts. In some instances the costs incurred by small agencies to contract may exceed in-house costs (*32*). In addition, these operations may be located in smaller communities with no competitive market for transit contracting. Contracted services are concentrated in the Northeast or the Southwest, whereas most operators doing no contracting are located in the Southeast.

RESEARCH RESULTS: IS CONTRACTING MORE COST-EFFICIENT?

If contracting is inherently more cost-efficient, those operators who contract for all of their transit services should be more cost-efficient than those doing no contracting. In addition, operators contracting for some transit services should experience cost savings over time. On the other hand, if contracting is not more cost-efficient, might there be strategies other than contracting to improve cost-efficiency?

The data set of 142 operators covering the period 1989 to 1993 was used to test this hypothesis. Thirty operators contracted for all transit services between 1989 and 1993. Another 87 operators did no contracting, and 25 contracted for some portion of their services over the entire 5-year period. The analysis shows that in the aggregate there is no evidence to support the hypothesis that fully contracted services are more cost-efficient than services operated by public agencies. In fact, agencies doing no contracting over the analysis period had lower operating costs per revenue hour than those that contracted for some or all of their services. In contrast, agencies contracting a portion of their routes may have experienced improvements in overall cost-efficiency because of contracting between 1989 and 1991, but since 1991 these gains have diminished because contracted unit costs for these agencies are rising faster than the rate of inflation.

Figure 1 shows that operators contracting for some of their services operate at much higher unit costs than those doing no contracting or those contracting all services. The least expensive operators are those doing no contracting. This result is marginally statistically significant at the 90 percent confidence level in 1990 ($t = 1.71$, $\alpha = 0.10$) when the difference between operators contracting all services and those not contracting was $5.64 per hour. Therefore, the hypothesis that the private sector is inherently more cost-efficient is not valid in the aggregate.

These findings probably indicate that contracting is not the panacea that it is purported to be by its strongest supporters. Contracting out fixed-route transit service is not the only nor necessarily the best way to lower operating costs in all circumstances. On the other hand, the findings do not indicate that contracting for services is generally inappropriate. It may well be that agencies choosing to contract for some of their services are in the highest-cost areas, that their high costs motivate them to undertake contracting, and consequently that they may be experiencing cost savings through contracting even though their hourly rates are the highest among the three groups. Similarly, agencies that do not contract for any of their services may not have any reason to consider contracting because they are in the lowest-cost service areas. Further insight regarding these points will be drawn from the regression analysis later in the paper.

When viewed in relation to the rate of inflation, Figure 2 shows that all three groups have performed well. Each has kept cost increases below inflation, but the group doing no contracting has shown cost increases at a much higher rate over the 5 years than the other two groups. As shown in Table 1, unit costs for the group that contracts some services declined between 1989 and 1991, but since 1991 costs have increased at a rate higher than for the other two groups.
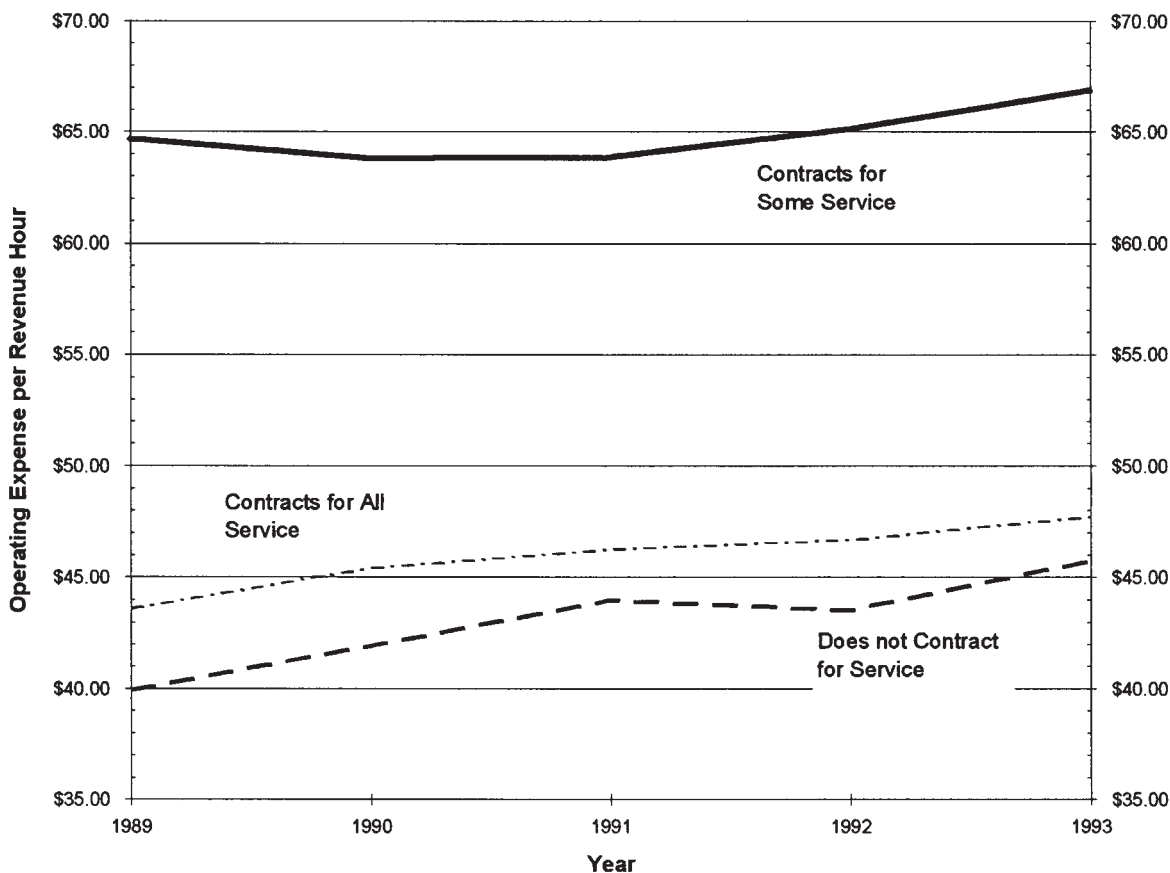

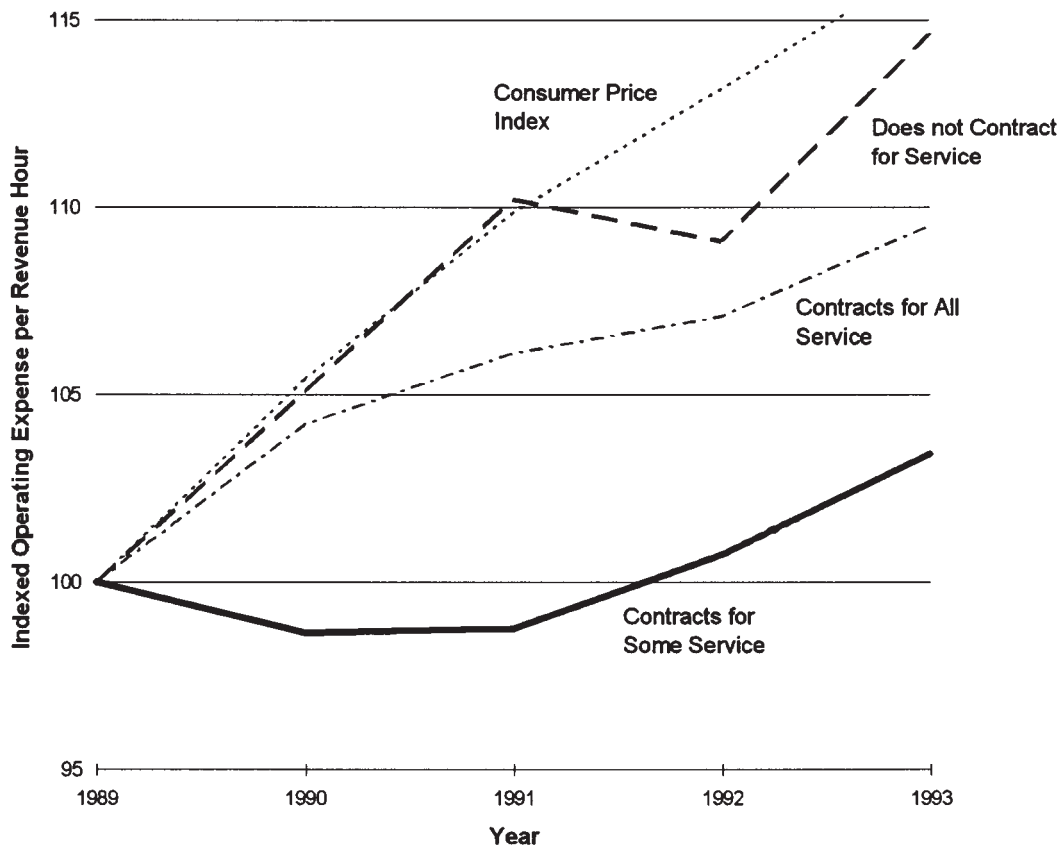**FIGURE 1   System operating costs per revenue hour.**

FIGURE 2   Operating costs per revenue hour indexed to inflation.

Cost-efficiencies for operators contracting some transit services improved for a period, suggesting that contracting has had some impact on their abilities to lower costs. The years in which costs declined were a period of expanding contract services for these operators. Figure 3 shows that between 1989 and 1990 this group expanded hours under contract, increasing service by a median of 13 percent, whereas publicly provided routes showed no increase. A survey by Goldstein and Luger supports this finding, with respondents citing service expansion as a principal reason for contracting, second only to cost cutting (*27*). However, the dominance of contract service among service expansions was short lived. Since 1991, directly operated services have composed the bulk of the added service.

Table 2 demonstrates the impact of contracting on operators outsourcing some of their routes. Only 3 years of data were available for this portion of the study because before 1991 FTA did not require

operators to allocate all costs associated with contracting, such as contract administration and monitoring, to the "purchased transportation" companies. Over the 3-year period operating costs per revenue hour of contracted services increased 2.7 percent more than directly operated transit, and between 1991 and 1993 contract costs as a percentage of directly operated costs increased from 71 to 73 percent. These increases by contract operations should be viewed with caution, because this growth rate is not statistically significant given the wide range of cost changes in the sample. This wide variation is demonstrated by operators such as Portland's Tri-Met, which showed contracting cost increases of over 143 percent for its six contracted peak vehicles. Capital Metro of Austin, Texas, running 108 peak vehicles under contract, experienced cost increases of 43 percent. In contrast, Oklahoma City's contract costs for its 14 peak vehicles declined by 46 percent. In general, contracting appears to have played a role in reducing costs between 1989 and 1991 for those agencies that contract

TABLE 1   Operating Costs per Revenue Hour

Operator Classification	N	Year					Percent Change	
		1989	1990	1991	1992	1993	1989-1993	1991-1993
No Contracting	87	$ 39.90	$ 41.93	$ 43.96	$ 43.52	$ 45.74	14.6%***	4.0%**
Some Service Contracted	25	$ 64.64	$ 63.75	$ 63.82	$ 65.10	$ 66.84	3.4%	4.7%*
All Service Contracted	29	$ 43.58	$ 45.41	$ 46.23	$ 46.66	$ 47.71	9.5%*	3.2%
CPI - All Urban Consumers		124.0	130.7	136.2	140.3	144.5	16.5%	6.1%

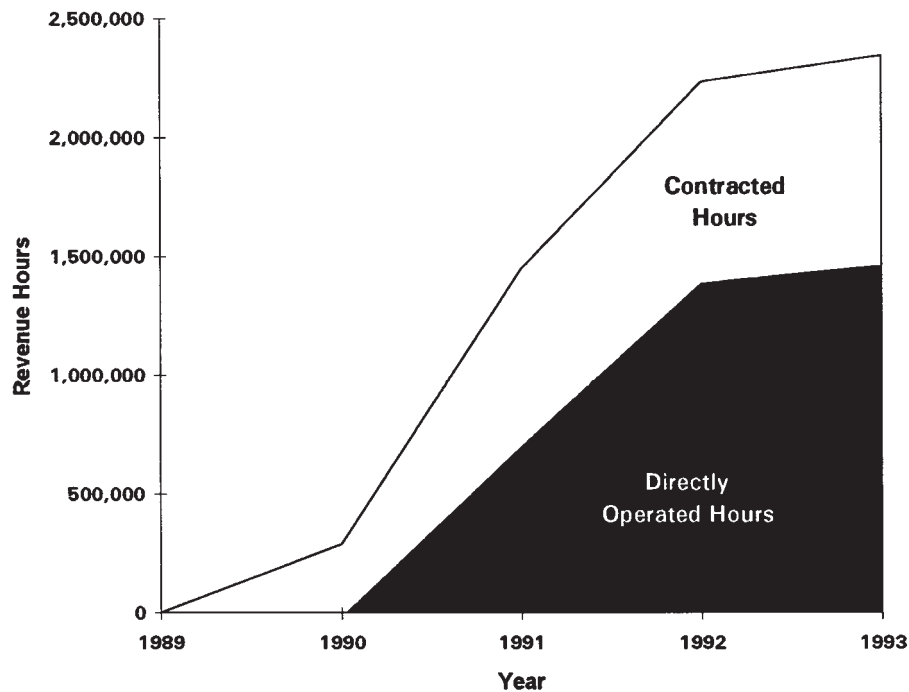* - *p*<0.05   ** - *p*<0.01   *** - *p*<0.001

FIGURE 3   Cumulative change in revenue hours for operators contracting some routes.

for some services. However, this trend has been reversed, and since 1991 costs appear to be increasing for these operators.

This analysis raises some interesting questions. Why is the group of agencies that contracts for *some* service decidedly more expensive than the other two groups? Since the evidence presented in this analysis does not support the notion that contracting is more cost-efficient than not contracting, what factors might contribute to higher operating costs per hour of service provided? Even more interesting is, Why are agencies that do no contracting at the very least no more expensive than agencies that contract for all of their services? To answer these questions a linear multiple regression model was developed to examine factors that contribute to operating costs.

MODELING COST-EFFICIENCY

Many factors affect the production costs of transit in addition to the extent of contracting done by an agency. Some are policies under the control of the transit agency, but many are the result of local conditions not easily changed by transit management. Among the many factors that affect production costs are the extent of peaking in demand and work rules. Cost-of-living differences between metro-

politan areas contribute to cost differences between operators from different parts of the country. High-density areas often have mixed land uses and traveler origins and destinations that are closer together, resulting in shorter transit runs and more efficient use of drivers and vehicles. Severe winter weather causes accidents, reduces speeds, and may require costly preventive measures against corrosion brought on by road salting during winter. Traffic congestion also increases the risk of accidents and reduces travel speeds resulting in scheduling, fuel, and maintenance inefficiencies. The political environment also plays a prominent role in operating costs (*26,33*). Emphasis on social equity and universal access by the public may require agencies to provide cost-inefficient services. Transit performance can and should be measured in other ways than cost-efficiency, and transit managers must consider these many additional factors. It was argued earlier, however, that the decision to contract is based primarily on the cost-efficiency criterion, and for this study contracting will be viewed in that way.

To explore how these many factors influenced transit costs for this sample in 1993, a linear multiple regression model was developed using data obtained from the National Transit Database (NTD), the COLI from the American Chamber of Commerce Research Associates (*29*), union membership data for 1990 produced by Hirsch

TABLE 2   Operating Costs per Revenue Hour for Operators Contracting Some Routes

Service Type	Year			Percent Change
	1991	1992	1993	1991-1993
Directly Operated Routes	$ 65.65	$ 67.58	$ 68.93	5.0%*
Contracted Routes	$ 46.77	$ 49.13	$ 50.39	7.7%
CPI - All Urban Consumers	136.2	140.3	144.5	6.1%

* - $p<0.05$

TABLE 3   Variables Used in Linear Multiple Regression Model

Model Variables	Definition	Measures	Expected Influence on Unit Costs
Dependent			
OPCST93	Operating Expense per Revenue Vehicle Hour	Cost Efficiency	
Independent			
AREA93	Operator service area per Federal Transit Administration guidelines	Service Area	+
COL94	ACCRA Composite Cost of Living Index, Third Quarter 1993	Cost-of-Living	+
DENSE93	Inhabitants per square mile of service area	Population Density	−
HRRATIO	Ratio of total vehicle hours to total revenue hours	Vehicle Scheduling	+
OPHR93	Ratio of driver pay hours to total vehicle hours (excluding charter service)	Labor Utilization	+
PCH93	Ratio of purchased revenue hours to total bus system revenue hours	Contracting	−
PKBASE	Ratio of vehicles in maximum service to vehicles operated at midday	Peaking	+
PKVEH93	Number of peak vehicles	Agency Size	+
POP93	Service area population	Political Environment (Population)	+
PREC	Mean annual precipitation in inches over a thirty year period	Climate (Precipitation)	+
SEATSTO	Average vehicle seating capacity weighted by vehicle hours	Vehicle Size	+
SNOW	Mean annual snowfall in inches over a thirty year period	Climate (Snowfall)	+
SPD93	Bus system operating speed in 1993	Traffic Congestion (Speed)	−
UNION90	Metropolitan Statistical Area unionization rates for 1990	Political Environment (Unionization)	+

and Macpherson (*34*), and mean annual snow and rainfall statistics from the National Oceanographic and Atmospheric Administration (*30*). The variables included in the regression model are presented in Table 3.

The data set for the regression model included 61 operators for which it was possible to obtain data for all the specified variables. Of these, 24 did no contracting over the period between 1989 and 1993, 23 contracted for some services, and 14 contracted all services over the 5-year period. Two variables in particular limited the data set to 61 operators. The COLI is based on voluntary reporting of data by chambers of commerce. This variable was available for only 98 operators. The second variable limiting the data set was labor utilization (*OPHR93*), consisting of the ratio of operator pay hours to total vehicle hours. Agencies operating fewer than 25 peak vehicles are not required to report this statistic to FTA, and over half of the operators in this sample were very small.

RESULTS OF THE MODEL

Does contracting lead to improved operating cost-efficiency? If so, then contracting would be an influential variable in the production costs of transit services. If not, then what factors best explain cost-inefficiency in public transit? The hypothesis that contracting is inherently more cost-efficient is not borne out by the regression model results summarized in Table 4. Surprisingly, the extent of contracting performed (*PCH93*) has the least impact of all the vari-

ables tested and is not statistically significant. The variables that best explain cost-efficiency are vehicle scheduling (*HRRATIO*) and labor utilization (*OPHR93*).

Vehicle scheduling is by far the strongest predictor of operating costs per revenue hour, with 78 percent more predictive power than labor utilization and well over twice the predictive power of any other variable. Only one statistically significant variable did not influence costs in the direction expected: the *SNOW* variable actually shows a downward influence on costs. Snowfall amounts are highest in eastern and midwestern cities characterized by higher-density urban form and more limited parking availability, which are more conducive to public transit use than the dispersed metropolitan areas of the Southwest.

Vehicle scheduling is a measure of the proportion of a transit operation devoted to deadheading. In general, agencies with high ratios are those that provide transit to a dispersed area. Buses must accrue deadhead miles to reach starting points for runs or to return to the garage after runs have been completed. Some buses may be *interlined;* that is, they continue operating as another route after one run, often an express run, has been completed. The number of routes that can be interlined, however, may be small because of scheduling or labor agreements. For example, many labor agreements limit driver runs to one route or place minima on the number of straight runs that an agency must provide for drivers (*28*).

In addition to deadheading, drivers may receive an allowance for traveling between the base facility and the beginning of the run, which is also an unproductive use of driver time. Thus, serving

TABLE 4   Results of Linear Multiple Regression Model, 1993

Model Variable	Measure	Coefficient	Standard Error	Beta
Dependent				
CSTHR93	Cost Efficiency			
Independent				
HRRATIO***	Vehicle Scheduling	95.401	13.411	0.500
OPHR93***	Labor Utilization	27.459	8.102	0.281
COL94**	Cost-of-Living	0.308	0.107	0.219
PKVEH93*	Agency Size	0.011	0.005	0.215
SEATSTO**	Vehicle Size	0.543	0.197	0.205
SNOW**	Snowfall	-0.137	0.047	-0.204
SPD93*	Speed	-1.235	0.581	-0.191
UNION90**	Unionization	47.612	18.571	0.187
DENSE93	Population Density	-0.001	0.001	-0.106
PREC	Precipitation	0.118	0.092	0.085
POP93	Population	0.000	0.000	-0.059
AREA93	Service Area	0.001	0.003	0.055
PKBASE	Peaking	-0.346	2.158	-0.013
PCH93	Contracting	-0.052	3.760	-0.001
CONSTANT***		-127.888	20.068	

R-Squared	0.88
Adjusted R-Squared	0.84
Standard Error	6.95
F-Statistic	24.15

*- $p<0.05$ ** - $p<0.01$ *** - $p<0.001$

dispersed areas also results in the reduced labor productivity captured in the labor utilization variable. As with vehicle scheduling, this variable also reflects advantageous work rules negotiated by unions on behalf of drivers. This result is further supported by the statistically significant unionization variable, which measures generalized unionization rates in the metropolitan area served by the transit operator. Labor utilization has a higher Pearson's correlation with operating costs among agencies that perform no contracting than it does among agencies that contract a portion of their routes. This result might reflect the effect of contracting on improving overall operator efficiency in these agencies. One way to provide a rough estimate of the impacts of changes for these two variables is to develop "elasticities" for them. That is, for a 10 percent reduction in a variable, what would the percent reduction in operating expense per revenue hour be? For this model, reducing deadheading (*HRRATIO*) by 10 percent would lead to a 19 percent reduction in unit operating costs, whereas a 10 percent improvement in driver scheduling efficiency (*OPHR93*) would produce a cost reduction of around 6 percent.

This analysis concludes that cost-efficient transit operations can be found in public agencies and are not the sole domain of the private sector. The analysis also reveals that vehicle scheduling and inefficient use of labor contribute greatly to higher costs. This finding implies that actions addressing vehicle and labor utilization will be the most effective path to increased cost-efficiency.

CONCLUSION

When viewed over time and in the aggregate, transit services operated by private contractors are not always less expensive or more efficient than services directly operated by transit agencies themselves. This study also does not find that contracting for transit services consistently fails to produce promised benefits. Rather, it has been shown that a complex set of conditions influences transit operating costs and operating efficiency. Often the provision of service to difficult service areas and restrictive work rules contribute most directly to increased operating costs. In some instances contracting out services might be the best way to improve the conditions for more cost-effective operation, and in some instances the threat of privatization can lead to improved efficiencies in directly operated services by promoting new contractual arrangements. On the other hand, the presence or absence of particular factors associated with high or low costs can differ from one transit operation to another. In some cases problems leading to high operating costs and poor efficiency can be addressed by public agencies through other approaches than contracting out service. Contracting can be a useful tool for improved efficiency, but it is not the only approach available.

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