Estimating the Potential Cost Savings of Transit Service Contracting

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The continued financial problems of the public transportation industry have motivated a search for more cost-effective ways of delivering transit services. Service contracting—the contracting of public transit services to private providers—has emerged as one of the most promising alternatives. Existing evidence suggests that service contracting could reduce public agency cost by 10 to 50 percent. If service contracting were implemented throughout the public transit industry, services currently provided by public agencies would be shifted to private provision. However, little is known about how such service shifts would affect transit service costs, and whether significant cost savings would occur. An assessment of the cost-savings potential of transit agency service contracting is presented in this paper. A cost model based on the concept of avoidable cost is used in a series of case studies to generate estimates of potential cost savings resulting from contracting various quantities of transit service. Research results showed average cost savings of 23 percent for the contracted service. These savings are equivalent to about 4 percent of the transit agency's total operating cost. Cost savings depend on a number of factors, but are roughly associated with the size of the transit agency. Cost savings for small agencies are insignificant and can be negative, while savings for agencies larger than 250 vehicles typically range between 5 and 7 percent of total operating cost when 20 percent of existing service is contracted.

The continuing financial problems of public transportation have motivated a search for more cost-effective ways of delivering transit services. This search has proceeded in two directions: (*a*) improving the internal cost efficiency of the services directly operated by transit agencies, for example by using part-time drivers, reducing absenteeism, and introducing computer technology; and (*b*) focusing on alternatives to the current service delivery system.

Although internal reforms are desirable, they rarely produce significant cost savings. For example, the use of part-time drivers, which is expected to be a major cost savings innovation, has been widely implemented but has led to relatively minor cost reductions (*1*). Equally significant is the fact that purely internal changes do nothing to address a fundamental factor behind the industry's cost escalation, namely the absence of competitive forces to keep costs under control. As a subsidized, monopoly-organized industry at the regional level, transit agencies face no economic incentives (beyond the simple availability of subsidies) to keep costs low. Not surprisingly, costs have risen at a rate exceeding inflation for the past 2 decades.

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Various forms of private sector involvement have been advocated as a means for injecting competition into the transit industry, thereby fostering more cost-effective service (*2*). Service contracting, the provision of transit services by private operators under contract to public agencies, has emerged as one of the most promising alternatives. Existing evidence suggests that transit contracting can provide services at costs 10 to 50 percent below public agency cost levels (*3*). Service contracting is widely employed for small local transit services, but its use among medium and large transit agencies is limited (*4*). Opportunities may therefore exist to realize large cost savings by wider use of contracting. Given transit's current fiscal environment, it is critical that the cost savings potential of this strategy be carefully evaluated.

Careful evaluation requires accurate estimates of potential cost savings for different levels of service contracting. It is likely that any significant implementation of contracting would include service currently provided by public agencies. However, there is little information available on the possible effects of contracting existing transit agency services. Institutional constraints [local labor contracts, as well as Section 13 (c) of the Urban Mass Transportation Act] severely restrict the transfer of public agency-operated service to private contractors. Indeed, there is only one known case—that of Tidewater Transit—in which such a service transfer has been accomplished. All other service-provider changes have occurred in situations where the public transit operator involved was acting as a contractor to a higher level funding agency (*3*).

Given the lack of actual experiences with this form of service contracting, a method for estimating potential savings is necessary. Presented in this paper is an assessment of the cost savings potential of transit agency service contracting based on the application of a new cost estimation model. Research reported here is part of a larger UMTA-sponsored project on the economic and institutional impacts of transit service contracting. Paper topics include (*a*) a discussion of the research problem in the context of previous research; (*b*) the modeling approach; (*c*) results of the model applications; and finally (*d*) an assessment of the cost savings potential of transit service contracting.

THE RESEARCH PROBLEM

An assessment of the impact of transit service contracting depends on the institutional structure of transit service provision. There are two general institutional forms for public transit in the United States. One form may be termed the consolidated agency, in which both funding and operating authority are vested in a single public agency. Regional transit authorities are examples of consolidated agencies. The second form may be termed the operating agency. A public operating agency provides service, but receives funding from another nonoperating entity. For example, counties, cities, and more recently, regional transportation boards may act as nonoperating agencies and pass public funds to local operating agencies. Contracting with private providers has occurred primarily in areas where the latter institutional form exists. Among consolidated agencies, contracting with the private sector has largely been limited to demand–responsive operations and occasionally to new services. Contracting implies the broker concept in the case of transit authorities: the agency retains responsibility and control of the service, but shifts operation to the private provider. In contrast, when funding and operating authority are split, the funding agency is, in effect, already a broker, and the service shift is simply from a public to a private provider. In both cases, cost savings depend critically on the changing role of the public operating agency.

Neither simple comparisons of public versus private costs nor traditional cost allocation approaches are appropriate for the estimation of potential cost savings of contracting existing services. Public–private comparisons give correct estimates of savings to a third party funding agency, but fail to incorporate cost impacts on the public operating agency. For example, if a county contracting with the regional transit district for service at $50 per vehicle hour decides to go out to bid and finds a private operator willing to provide the same service at $40 per hour, savings will be 20 percent because the country's responsibilities with respect to the service have not changed. However, if the transit district performs the same exercise (assuming all costs are the same), it will not necessarily save 20 percent because its responsibilities with respect to the service have changed. Although it formerly had both administrative and service functions, the transit district retains the administrative function under contracting. Thus, savings for the transit district will be less than 20 percent.

Use of fully allocated cost estimates is not appropriate for two reasons: (*a*) if the transit agency retains some responsibility for the service, then certain costs will remain even in the long run, and cost allocation approaches will tend to overstate potential cost savings; and (*b*) cost allocation models involve implicit assumptions that costs respond in the same manner to both service increases and decreases, and that all costs are affected equally by the service change. Although these assumptions are conceptually reasonable, the nature of the transit service production process suggests this may not be the case. Specifically, the divisibilities of transit inputs (labor and vehicles), and the relationships of factor inputs in production processes are such that reductions in output may not result in corresponding reductions of all inputs.

The research problem, then, is to determine how transit agency operating costs change when a portion of service is contracted, and to determine a basis for comparing public and private operator costs. Costs to be considered depend on the assumptions made regarding service contracting arrangements. Significant portions of overhead or administrative costs, such as planning and marketing, may not be reduced when service is contracted. The appropriate comparison is between the transit agency costs that are reduced as a result of service contracting (net of any additional costs generated by the contracting), and the costs incurred by the private operator in providing the service. These transit agency reduced costs are the incremental costs of not providing the service, and are termed avoidable costs.

Several studies of the cost impacts of transit service contracting have been conducted. A variety of methodological approaches have been utilized in these studies, generating a wide range of results. For example, a study of express commuter services in the Los Angeles region predicted contracting cost savings of about 50 percent. A fully allocated cost model was used in the study, and no adjustments were made for the administrative and other costs that would not change under contracting (*5*). A comparative study of unit cost differences between public and private express bus service estimated cost differences ranging from –11 to 43 percent, depending on route length and vehicle utilization assumptions (*6*). Both public and private costs were based on cost allocation models.

A different approach was taken in a Boston study. In this case, the cost comparison for a set of express bus routes was between the direct (variable) transit agency cost and the full private agency cost (*7*). The justification was that the service reduction was so small that it would have no impact on the fixed costs of the transit agency, but the private operator would incur full incremental costs in providing the service. Study results indicated that cost savings would occur only if the transit agency retained ownership of the vehicles.

One of the most detailed cost studies was conducted by McKnight and Paaswell (*8*). Its purpose was to determine possible contracting cost savings for the Chicago Transit Authority (CTA). A modified cost allocation approach that distinguished between fixed and variable costs was used to estimate CTA cost reductions. Because of the marginal nature of the contracting options considered, all administrative and fixed facility costs were assumed fixed. The procedure also distinguished between short-run and long-run cost reductions. The study indicated savings ranging from 15 to 60 percent, depending on specific service characteristics.

MODELING APPROACH

The purpose of this research was to develop a methodology for estimating potential cost savings that would be applicable for a wide variety of service alternatives. The first step was to develop a set of assumptions regarding feasible service arrangements. Recognizing current institutional and organizational constraints to contracting existing transit services, two initial assumptions were made:

1. The scope of contracting alternatives is limited by the employee attrition rate (approximately 5 percent per year) because the replacement of transit agency employees by private service providers is essentially precluded if federal subsidies are involved; and
2. Service delivery options that minimize the need for cooperative action between the operating personnel of public and private operators are preferable.

For the purpose of estimating cost impacts, two time horizons are identified: the short run (1 to 2 years); and the long run (approximately 3 to 5 years). Given the first assumption, long-term contracting options are limited to approximately 20 percent of total existing service. In view of the second assumption, the route was selected as the unit of service to be contracted.

The Transit Cost Model

The transit cost model is an engineering-type model and is based on factor inputs (e.g., labor, maintenance, administration). Costs are allocated to input categories, and the change in cost due to a change in service is estimated for the resulting changes in input categories. The model has both a short-run and long-run component. In the short run, it is assumed that only the direct service costs—driver cost; fuel, oil, and tires; and scheduled maintenance and servicing—are avoidable. In the long run, avoidable costs are determined by contract service arrangements. The cost model is based on the following set of assumptions:

1. The transit agency supplies the vehicles and retains responsibility for vehicle insurance;
2. The private operator maintains the vehicles;
3. The transit agency retains responsibility for service system planning, marketing, public information, and general administration;
4. The transit agency retains all fare revenue; and
5. The transit agency retains responsibility for all fixed facilities.

All cost elements corresponding to functions assumed to be retained by the transit agency are fixed in the long run.

The transit cost model consists of a series of submodels: the driver cost model, the direct vehicle operating cost model, and the long-run cost model. Because driver cost is both the largest cost item and the most variable, it is potentially the largest source of error. It is therefore modeled with the greatest detail. Driver cost estimation is based on the relative efficiency of different driver work assignments. Efficiency is measured by the ratio of pay hours to platform hours (driving hours). The driver cost model requires runcut and schedule data. For a given service contracting package, driver cost is estimated from the number and combination of runs required to operate the service. The model takes the following into account: part-time driver provisions, interlining (the practice of assigning driver runs to more than one route), wage and benefit rates, driver absence coverage (unscheduled pay time), and scheduling practices.

Other direct vehicle operating costs are estimated on a mileage basis using data from Section 15 of the Urban Mass Transportation Act. The long-run administrative and other avoidable costs are also estimated using the appropriate functional categories from Section 15 data. It is assumed that variable long-run costs (maintenance, administrative, and other costs) are directly proportional to output. Admittedly, this is a strong assumption; however, data are not available on the long-run response to major transit service reductions, and cross-sectional data indicate that both maintenance and administrative costs are strongly correlated (approximately 0.91 and 0.97, respectively) to system output, as measured by revenue vehicle miles. A flow diagram of the transit cost model is shown in Figure 1.

The transit cost model was developed primarily for larger transit systems (e.g., with 150 or more vehicles). For smaller systems, data availability is more limited, and the model is simplified accordingly (see section entitled Model Application Results).

The transit cost model also employs alternative assumptions for cost elements that may have an uncertain impact. For example, agencies with part-time drivers may choose to allow the full-time and part-time forces to decline at the same rate, or part-time drivers may be retained while the full-time driver force is allowed to decrease. In addition, maintenance labor costs may not decline immediately in direct proportion to the amount of service contracted in the short run; therefore, a lower bound of a 50 percent proportional reduction in this cost element is assumed. The alternative assumptions are used to generate upper and lower bounds of avoidable cost. These are termed optimistic and pessimistic. A most-probable estimate gives the most likely point estimate of avoidable cost. Alternative assumptions are summarized in Table 1.

Estimating Private Provider Costs

Private operator costs are estimated in a much simpler manner. The private operator cost estimates are used only for illustrative purposes. Actually, private costs would be determined by bids on the service package. For peak period service operated by transit agencies with more than 150 vehicles, private operator costs are estimated with a three-variable cost model based on vehicles, platform hours, and total vehicle mileage. The cost model estimates for peak service generally range between $2.75 and $4.00 per revenue vehicle mile, depending on service characteristics. A flat mileage rate is used for all-day service. The flat mileage rate is adjusted by the size of the transit system and is based on actual survey data for contracted operations of various sizes. The size of the transit system is used as an approximate surrogate for cost differences between private operators of different sizes because the absolute quantity of service that could be contracted is a function of transit system size. It is assumed that service parameters are the same for the private operator. That is, the cost estimate is based on the same platform hours and mileage as that of the transit agency. Because the transit agency owns the vehicles, no capital costs are included.

No distinction is made between short-run and long-run costs for the private operator. Because the service is new, it is assumed that the private operator must incur full service cost at the outset. Alternative assumptions are employed regarding driver pay provisions and direct vehicle operating costs. As with the transit cost model, upper- (pessimistic) and lower- (optimistic) bound estimates are generated from alternative assumptions. Private operator cost parameters are summarized in Table 2. Contract monitoring costs incurred by the transit agency are also included in the private operator cost estimate,

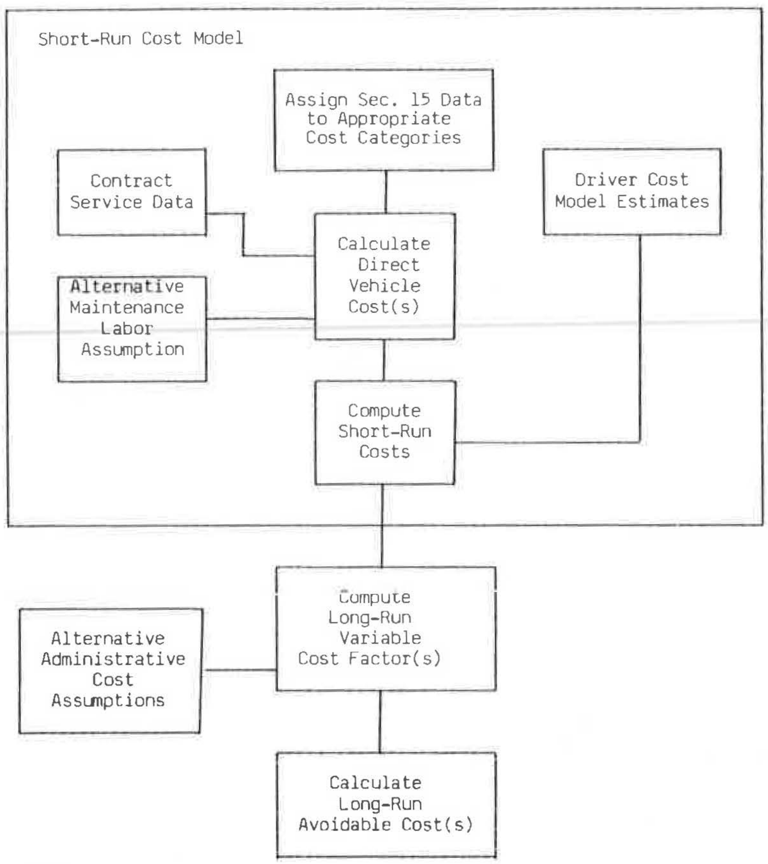

FIGURE 1 Flow chart of the short- and long-range transit cost model.

TABLE 1 ASSUMPTIONS USED TO GENERATE ALTERNATIVE AVOIDABLE COST ESTIMATES FOR TRANSIT AGENCIES WITH MORE THAN 150 VEHICLES

	Optimistic: High Avoidable Cost	Pessimistic: Low Avoidable Cost	Most Probable Avoidable Cost
Driver Cost (Short-Run and Long Run)			
Interlining	Assume all leftover pieces can be reincorporated in schedule with no loss of efficiency	Assume one-third of the leftover pieces must be operated as trippers	Leftover pieces can be reincorporated in service schedule
Part-time operators (PTOs)	Reduce only full-time operators (FTOs) through attrition; retain current number of PTOs	Reduce both FTOs and PTOs through attrition in proportion to current levels of utilization	Reduce both FTOs and PTOs through attrition in proportion to use on contracted service
Direct Vehicle Operating Cost			
Short run only	Maintenance labor cost reduced in same proportion as amount of contracted service	Maintenance labor cost reduced at 50 percent of proportion of amount of contracted service	Maintenance labor cost reduced at 75 percent of proportion of amount of contracted service
Long run	Costs are reduced in the same proportion as amount of contracted service		
Administrative Cost			
Short run	No reduction of administrative costs		
Long run	Proportional reduction in cost of selected administrative functions	No reduction in cost of selected administrative functions	Proportional reduction in cost of selected administrative functions

TABLE 2 PRIVATE CONTRACTOR COST ASSUMPTIONS

	Optimistic (Low Cost)	Pessimistic (High Cost)	Most Probable
Peak-Service Model			
Driver cost	Paid for platform hours only	4-hr guarantee per piece	2-hr guarantee per piece
Mileage-related cost	$0.72/TVM[a]	$0.87/TVM	$0.82/TVM
Administration/overhead	$10,000/bus/yr	$10,000/bus/yr	$10,000/bus/yr
Profit (%)	10	10	10
All-Day Service[b]			
Less than 25 vehicles	$1.88/RVM[c]	$1.88/RVM	$1.88/RVM
25 to 150 vehicles	$2.00/RVM	$2.35/RVM	$2.20/RVM
Greater than 150 vehicles	$2.00/RVM	$2.75/RVM	$2.35/RVM

[a]TVM = total vehicle mile.
[b]All-day service according to transit agency size.
[c]RVM = revenue vehicle mile.

and are adjusted by transit agency size as well. Alternative assumptions are also employed (Table 3).

MODEL APPLICATION RESULTS

The previously described models were used to conduct case studies of 22 U.S. transit agencies. These agencies range from very small (less than 25 vehicles) to very large (1,000 vehicles) and are representative of a wide range of operating conditions and regional differences.

Selection of Service Packages

The case studies were divided into three size categories: small (less than 25 vehicles), medium (25 to 149 vehicles), and large (150 or more vehicles). The 150-vehicle cutoff was used primarily because of size-related cost differences among private operators revealed in the survey data (*4*). In addition, there are size-related differences among public transit agencies. Agencies of less than 150 vehicles, on average, provide very little peak-only service, and therefore have a potentially more efficient service schedule. In addition, several of the case study agencies within this size category report Section 15 data at the less detailed R level, necessitating some adjustments of the transit avoidable cost model.

For the smallest systems, it was reasoned that service contracting would be an all-or-nothing decision because there would be no incentive to incur the burden of monitoring a contractor and continue to operate a minimal amount of service. In addition, it would be very difficult to remove a significant portion of service without adverse effects on the remaining schedule. Thus, for the smallest systems, it was assumed that the whole system would be contracted.

For each transit agency with more than 25 vehicles, at least two service packages were identified, comprising 5 percent and 20 percent, respectively, of the agency's existing service. The 5 percent package corresponds to the first year of contracting, and the 20 percent package represents the maximum possible for a 5-year time horizon given the assumptions presented previously.

The service packages selected consisted of fixed-route service only; no demand-responsive operations or other special services were included. The route selection procedure was to (*a*) calculate the pay hour/platform hour ratio for each route, and (*b*) choose the routes with the highest ratios. The "pay/plat ratio" is the ratio of scheduled pay hours to platform hours (driving hours) for the weekday schedule. It is a measure of schedule efficiency and depends on both the service profile

TABLE 3 TRANSIT AGENCY MONITORING COST ALTERNATIVE ASSUMPTIONS

Transit Agency Size	Pessimistic	Optimistic	Most Probable
Less than 25 vehicles	5% of contract cost; $30,000 minimum	10% of contract cost; $75,000 minimum	7.5% of contract cost; $50,000 minimum
25 to 150 vehicles	5% of contract cost; $50,000 minimum	10% of contract cost; $100,000 minimum	7.5% of contract cost; $75,000 minimum
Greater than 150 vehicles	5% of contract cost; $75,000 minimum and $300,000 maximum	10% of contract cost; $100,000 minimum and $1,000,000 maximum	7.5% of contract cost; $100,000 minimum and $500,000 maximum

TABLE 4 CHARACTERISTICS OF THREE SMALL SYSTEMS

System	No. Peak Vehicles	Average Cost/RVM ($)	Average Cost/RVH ($)[a]	Driver Wage Rate ($)	Peak/Base
A	12	2.45	37.00	9.48	N/A
B	24	2.24	29.00	8.94	2.5
C	21	2.53	27.80	9.08[b]	1.5

[a]RVH = Revenue vehicle hour.
[b]Part-time operator wage is $4.25.

(e.g., peak/base ratio) and driver work rule constraints. This procedure selected predominantly peak-oriented routes first, as would be expected. For some of the largest agencies, an all-day service package was also selected in order to generate comparisons for both peak and nonpeak service. This was not necessary for the medium and small systems, because peak service was exhausted long before the 20 percent limit was reached.

Small System Results

Three case studies of systems with less than 25 peak vehicles were performed; all are municipal systems located in different regions of the United States. The participating transit agencies are not identified by name because of the sensitivity of this research. Descriptive characteristics are given in Table 4. Average hourly costs of Systems B and C are low, as is typical of small systems. System A is located in a high-cost region and has somewhat less favorable work rules than Systems B or C. System B pays a very low overtime rate, can hire up to 40 percent part-time drivers, and has no 8-hr per day guarantee for extraboard drivers. System C provides a 40-hr per week guarantee for drivers and uses part-time drivers with a wage rate of $4.25 per hour for the extraboard. The differences in average mileage costs are due to differences in average speed.

The cost estimation method was adjusted to reflect the entire system's being contracted out, and the much less detailed Section 15 data provided by the small systems. It was also assumed that vehicle insurance would become the responsibility of the private contractor because the public agency would have no reason to retain insurance if it were no longer an operating entity. Costs are long run only, and account for the fixed monitoring, planning, and administrative responsibilities of the transit agencies. Private operator costs are estimated using the costs and assumptions indicated in Tables 2 and 3, plus an estimate of additional insurance costs. Cost savings are calculated by comparing the transit agency avoidable cost with the private operator cost. If the avoidable cost is greater, cost savings will be positive; if the avoidable cost is smaller, cost savings will be negative, indicating that the transit agency would incur higher total costs as a result of service contracting. All cost estimates were made on the basis of annual costs. Results of these comparisons are given in Table 5. Cost savings are computed as a percent of transit agency avoidable costs. Differences between the optimistic, pessimistic, and most probable estimates are due to the alternative monitoring cost assumptions.

Because private operator costs are calculated at a constant rate, estimated cost savings are directly related to transit system costs. System A could realize small but significant savings, while System C would incur higher costs. System B would realize very limited savings from contracting. These results are reasonable, considering the characteristics of these systems. Given the level of efficiency of System C, the difference in private operator cost is not enough to offset the fixed administrative and monitoring costs associated with the contracting option. The opposite is the case for System A.

TABLE 5 COST SAVINGS FROM PRIVATE CONTRACTING FOR THREE SMALL SYSTEMS

System	Optimistic[a]	Pessimistic	Most Probable
A	9.9	5.6	7.7
B	6.3	1.8	4.1
C	–4.7	–9.7	–7.2

Note: All figures in percentages.
[a]Optimistic estimates give the difference between the highest transit agency avoidable cost and the lowest private cost. Pessimistic estimates compare the lowest transit agency avoidable cost and the highest private cost. The most probable estimate uses the most probable cost for both transit system and private operator.

Medium-Size System Results

A total of six case studies were performed for systems of 25 to 150 vehicles. Descriptive characteristics of the case study systems are given in Table 6. The driver compensation rate includes wages and benefits and is calculated from Section 15 data. The pay/plat ratio is calculated from schedule (runcut) data.

Because the medium-size transit systems are less complex operations than the larger systems for which the costing methodology was developed, and because of the more limited data availability, a simpler method of estimating avoidable cost was used. Simplifying assumptions used are (*a*) interlining impacts are not considered, (*b*) maintenance cost is variable in both the short run and long run, and (*c*) a flat 50 percent of administrative cost is fixed in the long run. As described previously, all private operator costs were calculated on the basis of revenue miles using the cost parameters and assumptions in Tables 2 and 3.

Because only one estimate of transit agency avoidable cost is made, the differences in the optimistic, pessimistic, and most-probable estimates are the result of the alternative private operator cost assumptions. Also, the difference between short-

TABLE 6 CHARACTERISTICS OF MEDIUM-SIZE CASE STUDY SYSTEMS

System	No. Vehicles	$/RVM	$/RVH	Driver Wage + Benefits/hr[a] ($)	Peak/Base Ratio	Pay/Plat Ratio
D	31	2.26	29.26	10.54	1.0	1.060
E	40	3.71	49.51	14.91	1.1	1.130
F	120	2.40	39.29	12.22	1.8	1.054
G	130	3.70	43.02	17.00	1.4	1.110
H	142	2.67	42.14	15.21	2.0	1.073
I	144	3.58	45.02	16.50	1.4	1.178

[a]Full-time drivers only.

TABLE 7 ESTIMATED COST SAVINGS FOR 5 PERCENT SERVICE PACKAGES FOR MEDIUM-SIZE SYSTEMS

	Short Run			Long Run		
System	Optimistic	Pessimistic	Most Probable	Optimistic	Pessimistic	Most Probable
D	−17.0	−44.0	−23.0	−5.2	−29.6	−10.3
E	11.9	−11.2	5.5	24.8	5.0	19.3
F	−9.1	−32.0	−24.5	−4.3	−25.5	−18.4
G	−3.9	−25.0	23.8	14.6	−2.8	3.1
H	32.8	19.2	−17.9	42.6	31.0	34.9
I	24.0	8.0	13.4	29.5	14.5	19.2

Note: All figures in percentages.

run and long-run transit agency avoidable cost is the indirect administrative cost.

The service packages were constructed by selecting routes in rank order of pay/plat ratios. The 5 percent packages include all of the peak-only services provided by the transit agency, but in most cases also contain all-day service. It may be noted that these service packages were chosen only for illustrative purposes; no attempt was made to select packages that might be more reasonable from an organizational perspective.

Short-run and long-run results for the 5 percent service packages are given in Table 7. The short-term results correspond to the first year of implementation, when only the direct transit service cost is assumed avoidable. The long-term results correspond to total adjustment of the transit agency. As before, cost savings are calculated as a percentage of avoidable cost.

The results in Table 7 indicate that for most medium-size agencies, significant cost savings are likely in the long run, but that cost reductions will be much smaller, and possibly nonexistent, in the short run. The much smaller (and potentially negative) short-run savings are attributable to the assumed absence of administrative cost reductions by the transit agency in the first year of implementation, as well as by the different private operator cost assumptions. In the long run, however, when all variable cost elements have been reduced proportionately, four of the six agencies save money by contracting according to the most probable scenario. The two agencies that are not predicted to save money have much lower wage rates and more favorable work rules than the other four systems. An example is the 40-hr per week guarantee rather than 8 hr per day, which effectively eliminates daily guarantee time and overtime. It should be noted that these are long-term annual estimates that do not take into account possible short-term losses.

The 20 percent service package provides a more representative indication of the cost impact of large-scale service contracting on transit agencies because a broader range of services are included and all impacts are long run. It is assumed that this magnitude of contracting could occur only after a number of years. Results for the 20 percent service packages are given in Table 8. As before, cost estimates for these systems are based on the simpler costing approach. The results of the 20 percent analysis indicate substantial cost savings in four of six cases. As with the 5 percent package, the negative results for Systems D and F are reasonable given the low wage rate and apparently efficient scheduling practices these agencies employ. Savings are greatest for Systems G, I, and E. Systems G and I have both the highest driver wages, and the highest and third highest pay/plat ratios. System E has the highest average hourly cost, as well as a comparatively high pay/plat ratio, given its low peak/base ratio. The average savings for the most probable scenario is 13.5 percent for the group, with a range from −16.1 to 31.0 percent. The median saving is somewhat higher at 21.1 percent.

TABLE 8 ESTIMATED LONG-RUN COST SAVINGS FOR 20 PERCENT SERVICE PACKAGES FOR MEDIUM-SIZE SYSTEMS

System	Optimistic	Pessimistic	Most Probable
D	−14.0	−40.0	−16.1
E	35.3	20.3	26.7
F	4.7	−12.0	−4.8
G	37.3	22.8	31.0
H	23.3	5.5	15.6
I	35.0	20.2	28.8
Average	20.3	2.8	13.5

Note: All figures in percentages.

TABLE 9 CHARACTERISTICS OF LARGE-SIZE CASE STUDY SYSTEMS

System	No. Vehicles	$/RVM	$/RVH	Driver Wage + Benefits/hr[a] ($)	Peak/Base Ratio	Pay/Plat Ratio
J	199	3.94	40.00	15.78	2.2	1.202
K	521	3.98	58.41	14.99	2.9	1.213
L	762	3.85	64.00	16.30	2.0	1.150
M	800	4.24	58.49	19.31	2.9	1.211
N	320	4.12	54.84	16.19	2.1	1.095
O	402	5.00	69.30	19.70	1.7	1.130
P	441	3.79	62.40	18.96	1.9	1.120
Q	231	3.05	40.48	15.34	2.3	1.160
R	844	3.76	50.69	18.26	1.9	1.130
S	659	4.50	62.72	14.63	2.3	1.150
T	1029	4.59	70.73	18.86	1.8	1.090
U	275	2.32	39.19	11.28	1.3	1.059
V	246	3.54	44.67	18.15	1.3	1.123

[a]Full-time drivers only.

It may also be noted that 20 percent savings are greater than 5 percent (long-run) savings in every case. This result appears to be counterintuitive, given that routes with the highest pay/plat ratio were chosen first. The difference, however, is due to the assumption of a minimum contract monitoring cost. The contract monitoring cost represents a larger proportion of private operator cost in the 5 percent service package because of the smaller total cost of the service package.

Large System Results

A total of 13 case studies were conducted for systems with more than 150 vehicles. Descriptive statistics for these systems are presented in Table 9. There is a substantial variation in size, average unit costs, driver costs, peak/base ratio, and pay/plat ratio. As a group, these are higher cost agencies with higher pay/plat and peak/base ratios than the medium-size systems. Many of these agencies use part-time drivers, but with one exception, they are limited to a maximum of 15 percent of the number of full-time operators.

The avoidable costs for these systems were calculated using the full cost models described previously, and the full range of alternative assumptions given in Tables 1–3. However, alternative costing assumptions for part-time drivers are used only when they are assigned in significant numbers to the service to be contracted and when their wage (plus benefits) rate is significantly different from the full-time driver rate.

Case study results are given in Table 10 for the 5 percent service package and in Table 11 for the 20 percent service package. In some cases (System L for the 5 percent package and Systems J and M for the 20 percent package), alternative service packages were selected to test the effects of different service configurations on estimated cost savings. For the

TABLE 10 ESTIMATED COST SAVINGS FOR 5 PERCENT SERVICE PACKAGES FOR LARGE-SIZE SYSTEMS

	Short Run			Long Run		
System	Optimistic	Pessimistic	Most Probable	Optimistic	Pessimistic	Most Probable
J	9.0	−58.0	−2.7	23.2	−22.9	14.0
K	20.1	−25.0	N/A	34.6	−1.5	29.5
L (express and regional)	18.7	−48.5	<1	36.5	1.0	25.8
L (express)	15.7	−75.4	−5.7	32.8	−17.3	20.8
M	40.0	−43.0	15.0	49.0	2.0	33.0
N	0	−80.2	N/A	32.7	2.3	25.0
O	27.8	−59.9	N/A	50.6	26.0	44.9
P	11.6	−55.9	N/A	31.0	3.7	21.4
Q	5.1	−56.0	N/A	11.0	−28.8	<1
R	29.5	−10.1	N/A	40.8	11.9	34.2
S	25.3	−21.1	N/A	31.4	7.4	26.1
T	10.0	−46.0	N/A	35.8	13.0	23.7
U	N/A	N/A	N/A	14.5	−19.0	<1
V	17.9	−16.2	N/A	29.5	11.6	20.0
Average[a]				32.0	−6.6	22.9

Note: All figures in percentages.

[a]Average excludes L express and regional.

TABLE 11 ESTIMATED COST SAVINGS FOR 20 PERCENT SERVICE PACKAGES FOR LARGE SYSTEMS

System	Optimistic	Pessimistic	Most Probable
J (express and all day)	27.3	−17.8	16.5
J (all day)	32.5	−9.0	19.2
K	35.5	9.7	27.9
L	37.7	18.5	26.9
M (express)	46.0	16.0	37.0
M (all day)	51.0	29.0	42.0
N	40.6	16.2	34.6
O	54.0	35.2	48.9
P	36.0	15.6	28.6
Q	21.7	4.9	15.4
R	43.4	16.8	35.7
S	36.4	20.3	32.7
T	43.3	23.7	34.7
U	15.2	−15.4	2.3
V	33.1	5.5	21.6
Average[a]	36.1	11.4	27.9

Note: All figures in percentages.
[a]Average excludes J and L all day.

remaining systems, routes were chosen on the basis of the pay/plat ratio. As a result, the 5 percent packages are made up primarily of heavily peaked routes.

As shown in Table 10, short-run savings are extremely variable. Pessimistic results, in which only driver costs and a portion of vehicle operation costs are eliminated and the interlining penalty is applied, are consistently negative. Large losses (up to 80 percent) are estimated in several cases. These results suggest that if only a small portion of the system is contracted, immediate savings may be negative. That is, agency short-run costs could increase. Long-run estimates are more positive. The average for the most-probable estimates is 22.9 percent, and none are negative. Only Systems Q and U show no savings. Three of the pessimistic estimates are negative, and all of the optimistic estimates are positive. The optimistic estimates range from 11 to more than 50 percent, with an average of 32.4 percent.

The long-run 20 percent scenarios indicate that savings will occur as all costs elements respond to contracting (Table 11). Again, these are annual estimates. Among the large systems, estimated long-run cost savings are often very large. For Systems M and O, most-probable savings exceed 40 percent, and 6 of the 13 systems have calculated savings of 30 percent or more. Savings are smallest for the system with the lowest wage rate, System U, which also has extremely favorable work rules (extraboard drivers start at $6.00 per hour with no guarantee).

Average most-probable savings for the 20 percent scenario for this group is 27.9 percent, significantly higher than for the medium-size systems. Estimated savings also cover a wide range, from 2.3 percent to 48.9 percent, implying that cost savings are a function of many factors. It is interesting to note that cost savings from contracting tend to be somewhat greater for the all-day service packages than for the express or peak-only packages. This is largely the result of the procedure used to calculate private costs, with alternative driver pay guarantees and overhead based on the number of vehicles employed. When the peak service consists of short pieces of work, private costs are high. Conversely, all-day service estimates tend to better reflect the difference between private and public wage rates.

Overall Results

The contracting cost savings estimates generated in the model applications span a wide range. Results for the 20 percent most-probable scenario for the 19 systems with more than 25 vehicles are summarized in Figure 2. In cases where more than

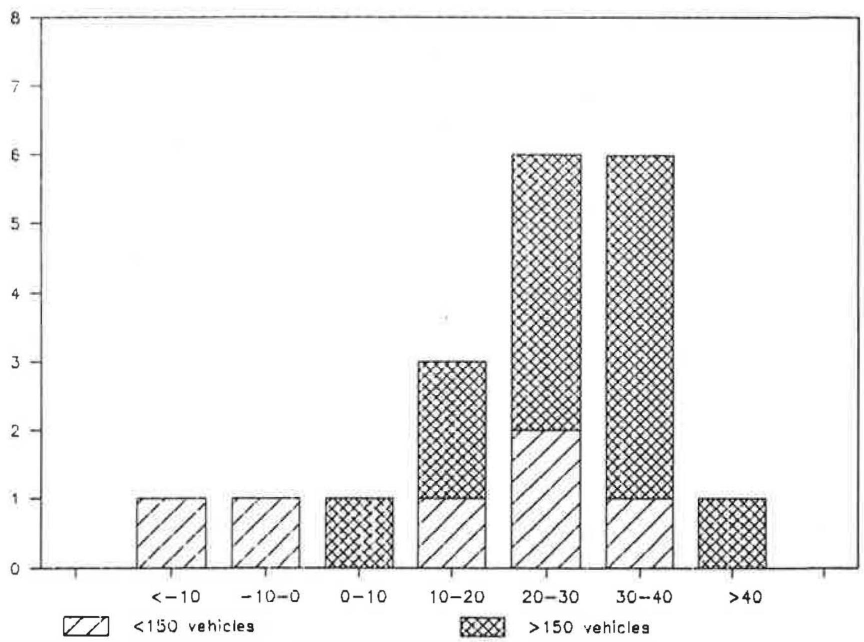

FIGURE 2 Distribution of savings for 20 percent most-probable scenario, all systems with more than 25 vehicles.

one 20 percent scenario was tested, an average value is used. Average most-probable savings is 13.5 percent for the six systems with under 150 vehicles and 27.9 percent for the larger systems. The distributions for the two groups clearly overlap, with the less than 150-vehicle group representing the minimum savings and the more than 150-vehicle group showing the maximum savings. The average savings for the entire sample is 23.4 percent, the median is 27.9 percent, and 12 of the 19 systems fall into the range of 20 to 40 percent.

CONCLUSIONS

The wide range of savings estimated by the model suggests that many factors affect potential cost savings. In part, these differences are a function of the assumptions and parameters used in the models, and the adjustments made to reflect size-related cost differences. It may be recalled that different methodologies were used to generate the cost estimates. For this reason, the case study results should be viewed as having limited comparability between transit agency size categories.

Discussion of Model Results

The wide range of cost savings estimates is also due to transit agency cost and service characteristics. A rough correspondence between transit agency operating costs or driver costs can be observed in the case study results, but the relationship is certainly not consistent enough to be able to use these factors to predict cost savings. Service characteristics, interlining, and the relative proportions of fixed and avoidable costs are important.

Interlining is an important factor in determining transit avoidable costs. The interlining penalty obviously affected the pessimistic avoidable cost estimates, implying that if schedule impacts are significant, potential cost savings will be affected. The impact of interlining is clearly an issue for further research, given the extent and variability of interlining practices within the industry.

The relative proportions of fixed and avoidable costs is another important factor in estimating potential cost savings. The general administration and other functions that are assumed not to change as a result of service contracting make up the fixed portion of long-run costs. The greater the proportion of these costs to total operating cost, the smaller the cost savings, all other things being equal. A high-cost agency may realize only modest cost savings if a large share of operating cost is fixed. Conversely, a lower-cost agency may realize large cost savings if a correspondingly smaller share of operating cost is fixed. In other words, service contracting strategies attack the service-related costs of productivity inefficiencies in public transit, not the nonservice or overhead inefficiencies.

The case study results also indicate that a key factor in transit agency cost savings is the rate at which indirect costs can be reduced. The large differences between short-run and long-run results show that net savings over a 5-year planning horizon are highly dependent on how long it takes to reduce maintenance and other indirect but variable long-run cost items.

Finally, it should be noted that the magnitude of cost savings estimated here would not necessarily hold for contracting larger proportions of transit agency service. Because the most costly service is selected first, the marginal change in cost savings should decline as the quantity contracted increases.

Cost Savings and Transit Costs

It is also interesting to place these estimated cost savings in context. Shown in Figure 3 is a frequency distribution of cost savings as a percentage of operating cost for the 19 systems

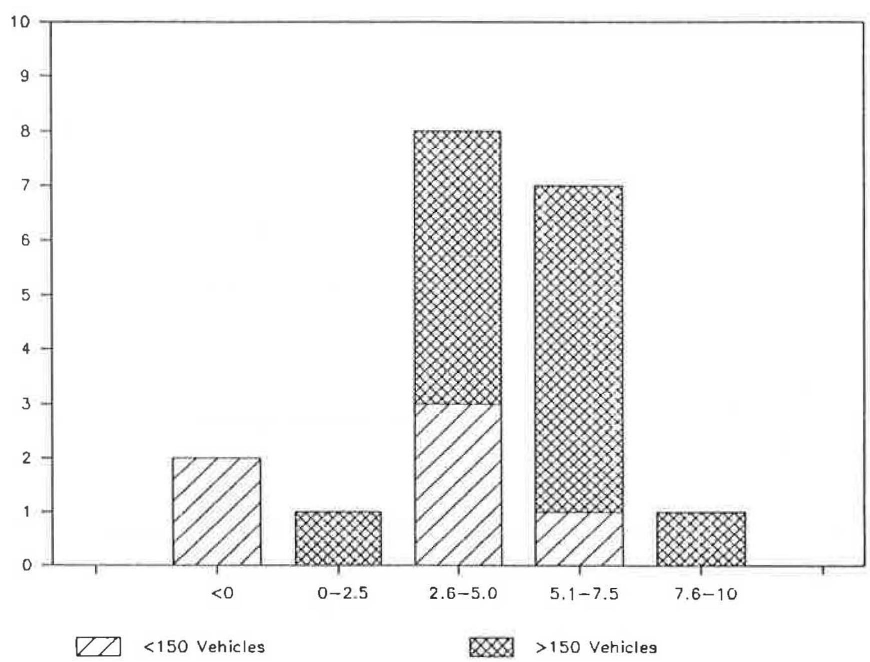

FIGURE 3 Distribution of savings as a percentage of operating cost, all systems with greater than 25 vehicles.

with more than 25 vehicles. The estimate corresponds to the 20 percent most probable scenario. In cases where more than one 20 percent scenario was tested, the peak-oriented service package estimate was used in the frequency distribution. Cost savings as a proportion of operating cost range from −2.5 percent (System D) to 9.0 percent (System O), and the average is 4.2 percent. A total of eight systems have cost savings of more than 5 percent. Savings of this magnitude are significantly greater than the potential savings of more conventional strategies such as using part-time drivers. Of these eight systems, all but one have fleets of 250 vehicles or more. A total of 16 of the 19 systems have estimated savings of 2.5 percent or more, implying that service contracting can generate savings of at least the same magnitude as more conventional strategies for the vast majority of larger U.S. systems.

From the perspective of the transit agency, these results indicate that potential benefits are greatest for the larger agencies, particularly when high wage rates coincide with service characteristics that are relatively favorable to private operator provision. For smaller agencies with low service costs, less controversial cost reduction strategies may be equally effective compared to a relatively low level of service contracting. On the other hand, competitive contracting may create strong cost containment pressures within the transit agency and lead to improved internal cost efficiency—a spillover effect that is not yet evident from other strategies.

From a public policy perspective, these results indicate that efforts to increase private sector contracting should be directed primarily at medium and large transit agencies—those with at least 150 vehicles, and particularly agencies with 250 or more vehicles. Among the transit systems reporting Section 15 data, 13 percent operate fleets of more than 250 buses, yet these 13 percent receive 80 percent of all reported subsidies for bus service. This analysis indicates that agencies of this size average contracting savings of 5.5 percent, and could typically save 5 to 7 percent of their total operating costs by contracting for 20 percent of their service. Nationally, this translates into an annual savings of $260 million to $365 million in required subsidy, or 8 to 11 percent of the nation's total transit subsidy bill for these bus systems. Savings of this magnitude provide a strong economic rationale for increased policy emphasis on competitive procurement of public transit services.

ACKNOWLEDGMENTS

Support from the Urban Mass Transportation Administration, and the Institute of Transportation Studies, University of California, Irvine, is gratefully acknowledged. Views expressed are those of the authors, and all errors and omissions are the responsibility of the authors.

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Publication of this paper sponsored by Committee on Bus Transit Systems.