

A Comparison of Privately and Publicly Owned Bus Companies and a Public Bus Transit Agency

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ABSTRACT

An examination is made of the level of service provided to patrons, the cost structure, the productivity, and the profitability of the companies that offer regularly scheduled bus service in the Metropolitan area of Helsinki, Finland, which includes the cities of Espoo and Vantaa. Data are given on the following types of bus companies: city-owned, private, and a public bus transit agency, Helsingin Kaupungin Liikennelaitos, in Helsinki. The data are averages, and they conceal a variance that is often substantial. It is believed that this variance is due more to management and managerial skills than to economies of scale or operating environment. Unit costs of bus transportation in the Helsinki region and the composition of these unit costs are presented. A discussion of productivity concludes the paper.

The Helsinki metropolitan area is composed of three cities--Helsinki, Espoo, and Vantaa (Figure 1). Both the population and employment are centered in Helsinki, as shown in Table 1. Three types of companies offer regularly scheduled bus service in the Helsinki area. Within the city of Helsinki, service is offered by the city's transit agency, Helsingin Kaupungin Liikennelaitos (HKL). A small part of HKL routes is operated by private bus companies for which HKL acts as service sponsor. In and from Espoo service is offered by several private bus companies and by a bus company owned by the city. The city is a sponsor for some normally unprofitable bus routes. The same arrangement prevails in Vantaa, where the number of sponsored routes is larger than that in Espoo.

The sponsored routes are awarded in negotiations with the operators. The principle of the historically owned traffic market plays a dominant role in these complex negotiations, which deserve a study of their own. Suffice it to say that because bus routes, schedules, and (maximum) tariffs are regulated, the private operators' last line of defense is to hang on to the market that they captured when regulation was less intrusive to private initiative.

The purpose of the study on which this paper was based (1) was to examine the level of service provided to the patrons, the cost structure, the productivity, and the profitability of the companies operating in the Helsinki area. The data pertaining to individual companies are confidential at their request. By permission the data to be reported are averages, weighted in the following ways: (a) the two city-owned companies (in Espoo and Vantaa); (b) all the private bus companies; (c) the Espoo-based companies, including the city-owned company; (d) the Vantaa-based companies; and (e) HKL, Helsinki's transit agency.

The averages conceal a variance that is often substantial. Without quantitative analysis, the authors believe that the variance is due more to management and managerial skills than to economies of scale or operating environment.

The paper is organized as follows: discussion of the data source and the operating environment, routes and patronage, level of service, tariffs, and the current financial situation of the bus companies; presentation of the unit costs of bus transportation in the Helsinki region and the composition of these unit costs; and discussion of productivity.

DATA SOURCE

The private bus companies provided their data generously. Ambiguities and matters of interpretation were clarified in confidential discussions. These data are considered accurate and reliable.

City-owned companies were reluctant to provide access to data and even to discuss them. Their data were obtained from the annual reports, schedules, and an annual legally mandated vehicle inventory. These data are not as good as those from the private companies, but every effort is made to ensure their accuracy and reliability.

HKL cooperated fully in the study; the agency did not provide access to bookkeeping but produced the data specified by the authors. Some data were subject to interpretation, because HKL also operates trams and a subway link. Nevertheless, every effort was made by both HKL and the authors to ascertain that only HKL's bus operations were covered by the data.

The data given in the paper are comparable and permit reliable cross-comparisons. Not all the data the authors wanted were available.

ROUTES AND PATRONAGE

In the Helsinki region some 320 bus routes are operated daily. Of these, 230 (70 percent) are covered by the study. The remainder are operated by small companies that did not wish to participate in the study, were in the process of merging or had just recently merged with another company, had an abnormally short or long accounting period as permitted by Finnish law, or operated on only a few routes.

The bus routes, schedules, and tariffs for intra-city operations are regulated by the city itself. Intercity routes and schedules are chartered by a regional, politically appointed policy-making body

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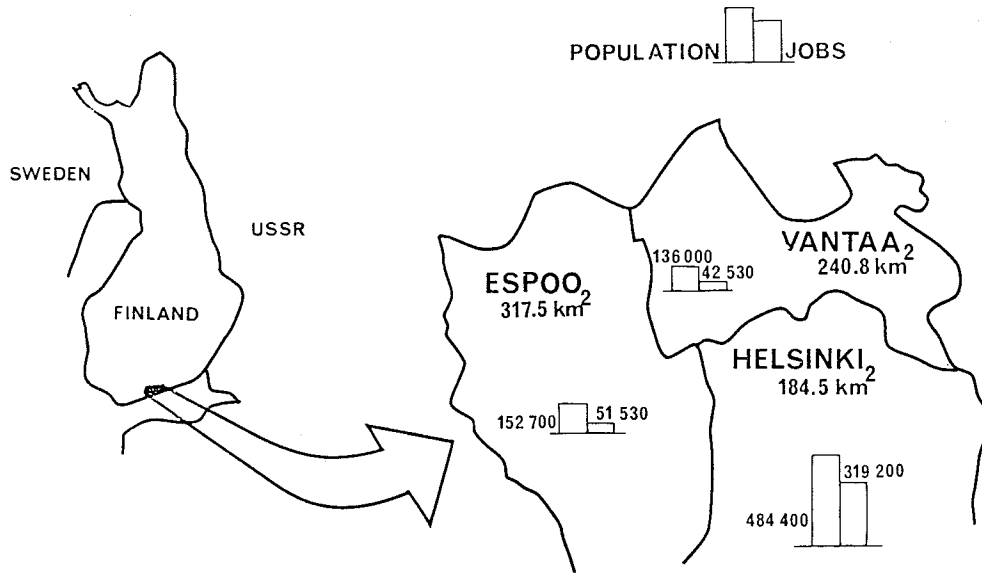


FIGURE 1 Study area.

TABLE 1 Bus System Attributes in Helsinki Region, 1982

	HKL ^a	Espoo	Vantaa	Total
Bus kilometers per population	43	94	99	63
Bus kilometers per square kilometer	117,720	45,120	56,425	65,490
Avg bus speed (km/hr)	20	30	33	
One-way route length (km)	10	19	26	
Patronage (passengers/yr)				
Peak	190,000	33,000	32,000	255,000
Off peak	175,000	31,000	26,000	232,000
Bus trips per population	0.77	0.48	0.47	0.66
Passengers per bus kilometer	4.4	1.3	1.2	

^aHelsingin Kaupungin Liikennelaitos, Helsinki's transit agency.

similar to a regional transit authority, but the fare tariff is decided by the Ministry of Transport.

Of the bus route kilometers studied, the private operators provide 41 percent; the city companies, 19 percent; and HKL, 40 percent (Figure 2). The distribution of total bus mileage among the three types of

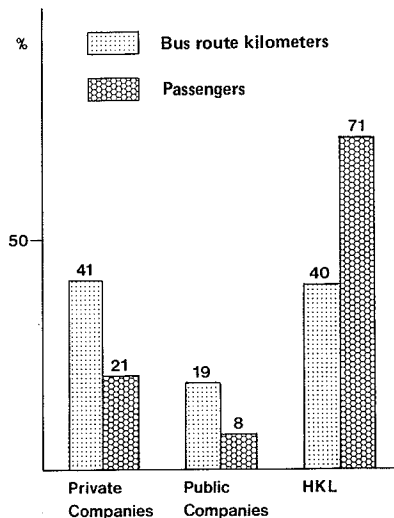


FIGURE 2 Distribution of bus kilometers and passengers in Helsinki region, 1982.

operators is 46, 23, and 31 percent, respectively. Figure 2 also shows the distribution and volume of passengers. Private operators serve 21 percent; city companies, 8 percent; and HKL, 71 percent of the total transit demand carried by bus.

LEVEL OF SERVICE

Bus service coverage and selected route and patronage information are given in Table 1. Service is the most dense in Helsinki, where there are short walk distances, headways, and route and trip lengths. Headways are 3 to 7 min during the peak period and 4 to 16 min during the off peak. An unspoken objective is to eliminate the need to remember the timetable. HKL's service is directed to the central business district (CBD).

In Espoo and Vantaa the trip attributes are longer. However, because the bus routes overlap after the residential collection area has been passed, headways may be markedly reduced by walking further to reach the buses when they are operating on the main line. The private operators offer a very good level of service from Espoo and Vantaa toward the Helsinki CBD from early morning well past midnight, weekends included. During the peak, headways vary between 5 and 30 min depending on demand; off-peak headways are twice as long. Schedule adherence is good.

The average bus speed is 20 km/hr in Helsinki and 30 km/hr or more in Espoo and Vantaa. There is an express bus service from Espoo and Vantaa to the Helsinki CBD with an average bus speed of 50 km/hr. Thus in the city HKL loses in speed what it gains with lower headways and shorter walk distances.

Besides walk distance, headway, and route coverage, load factor is an important service attribute. Substantial differences exist among the companies. Measured at the peak-load point during the peak hour, HKL's load factor was 0.74. In Vantaa and Espoo the corresponding factor was 0.47. During the highest off-peak hour the load factors for Helsinki and Espoo-Vantaa were 0.48 and 0.20, respectively.

HKL's overall load factor is not much greater than that of the other bus operators because the average trip length in Espoo and Vantaa is 2 to 3 times longer. Low monthly and yearly passes encourage the Helsinki citizens to use public transport over

TABLE 2 Bus Size and Load Factors for Helsinki Region, 1982

	Private Company	Public Company	HKL	Espoo	Vantaa
Bus capacity (no. of passengers)	56	59	69	59	54
Seats	44-56	—	37	44-58	44-50
Standees	0-10	—	32	0-10	0-10
Load factors					
Peak	NA	NA	0.74	0.47	0.47
Off peak high	NA	NA	0.48	0.20	0.20
Overall	0.27	0.25	0.30	0.23	0.31
Passengers per bus kilometer	1.3	1.2	4.4	1.3	1.2

short distances. As shown in Table 2, the number of passengers per bus kilometer in Helsinki is 3.5 times that in Espoo-Vantaa.

A better measure to examine the load factor would be passenger kilometers per seat kilometer, but such data were not available. In general, several bus companies knew surprisingly little about their demand patterns, demonstrated by the range in load factors between 0.20 and 0.40 for private operators.

The percentage of seats in the total passenger capacity is 0.54 in an HKL bus and 0.70 in an Espoo-Vantaa bus. For this reason, even during the off peak the likelihood of standing in an HKL bus is rather great. The operators from Espoo and Vantaa make an attempt to offer a seat for each passenger. HKL, on the contrary, attempts to fill the buses. This is also clearly shown by the buses that the companies use. On the average the private companies have the smallest and the largest buses. Table 2 shows both the load factors and bus sizes.

Routes, headways, operating speed, and load factors can be summarized by looking at the vehicle fleet requirements at various times of operation, as shown in Table 3. Designation of the operating hours in Table 3 is flexible because they differ by line. The data show that private companies have more vehicles in off-peak service than do public companies and that the public companies and HKL have too large a vehicle fleet. HKL acknowledges this, but wants to keep the reserve buses in case the subway breaks down.

TABLE 3 Fleet Size by Time of Day in Helsinki Region, 1982

Period	Percentage of Total Fleet				
	Private Company	Public Company	HKL	Espoo	Vantaa
A.M. peak	95	78	77	90	83
P.M. peak	86	76	77	85	83
Base	45	—	27	56	30
Evening	30	—	22	33	23
Night	17	—	8	19	13
Saturday	36	—	30	41	26
Sunday	32	—	23	39	23

TABLE 4 Principal Fares in Helsinki Region, 1982

Type of Fare	HKL	Espoo	Vantaa
Single	Adult, \$0.70 Child, \$0.25	\$0.60 up to 6 km + \$0.10 per 2 km	Adult, \$0.60 Child, \$0.30
Multiple	10 trips (10) Aged or handicapped (80) Year pass, ^a \$120 30-day pass, \$12 30-day pass for students and children, \$4	50 trips (30) 25 trips (15) 10 trips (10) Children (50)	30-day pass, \$12

Note: Fares are given in U.S. dollars. Percentage of discount is given in parentheses.

^aPasses sold only to Helsinki residents.

Many bus operators, private ones included, were interested in the peak-period data only because they determined the fleet size. Subjective methods and rule-of-thumb procedures were used to make optimal or even effective use of resources. This was seen from the methods used to plan bus routes and to construct timetables and run schedules, and from the lack of knowledge of demand. All this was reflected in the productivity and profitability indices. Immediately, of course, it could also be seen from the bottom line.

TARIFF STRUCTURE

The tariff structure in the Helsinki region was complicated at the time of the study. Three different tariffs existed: the tariff approved by the Ministry of Transport, which applied in intercity traffic and also within Espoo; the city of Helsinki tariff with its low monthly and seasonal passes; and the flat-fare tariff for sponsored traffic in Vantaa. The principal fares and tariffs in 1982 are shown in Table 4. It should be mentioned that only the Ministry's fare schedule depends on distance. HKL's flat fare is expensive for short trips and Vantaa's flat fare very cheap for long trips. (The tariff structure has changed since 1982, and also Espoo and Vantaa now have seasonal and monthly passes.)

CURRENT FINANCIAL SITUATION

The annual bus operations turnover for HKL was approximately \$85 million (\$1 U.S. = 5.4 Finnish marks). For the other bus companies the annual sales ranged from \$1.5 million to \$7 million. The average for the city-owned companies was \$4.8 million and for the private ones \$3 million. Excluding HKL, the bus companies studied were small, with fleet sizes from 23 to 117.

Bus companies engage in economic activity like any firm in the market. The income consists of fare-box revenue from the regularly scheduled and charter traffic. There is also minor income from selling old buses.

For the city-owned companies the provision of capital stock monies is also a type of income. The capital stock is provided by the city with zero interest and there is no requirement to pay it back. Private companies borrow their operating capital and pay it back with interest; there is, naturally, a return-on-investment requirement on the invested capital. On a per-bus basis the capital stock is 20 times larger in the city-owned companies than in the private ones.

The city-owned bus companies must accept the operation of sponsored routes, some of which may entail substantial deadheading. The city also plays a role in personnel policy and politics, and the company president has a more limited authority than in the privately owned bus companies.

HKL is similar to the city-owned companies, but in addition to farebox revenue it receives a direct subsidy to cover the deficit. For bus operations this subsidy is about 45 percent of the budget.

In any sustained economic activity, income must be greater than expense. Because Finnish laws permit flexibility in depreciation, taxes, and investment funds, the accounting procedures can yield a deceptive picture about income and costs. Therefore the data chosen to depict profitability of the bus operations include not only the accounting costs and income but also the cash-flow balance (per bus kilometer) and share of income financing. Cash-flow balance differs from the accounting profit in that it excludes depreciation, changes in investment reserve fund, and tax refunds, which may cover several years.

Data in Table 5 show that on the basis of accounting costs and income the city-owned bus companies are as economical as the private ones. However, the net cash-flow balance is 35 percent better for the private companies than for the city-owned companies. Helsinki's transit agency operates at a substantial loss.

There is a large difference between companies based at Espoo and those at Vantaa. Part of this difference is explained by the much newer equipment of the Espoo-based companies. This advantage and the rest of the difference between the two cities are rooted in managerial skills. Again, the (weighted) average conceals large differences among the private companies.

The profit margin of the city-owned companies is unlikely to be as large as that shown in Table 5. Nonetheless, they do quite well. One reason, besides good management, for this profitability is the sponsored routes, whose net yield is greater than that of the "market" routes.

In Espoo the sponsored routes pay \$1.10/km and in Vantaa \$1.17/km. When these incomes are compared with the costs in Table 5, it is seen that the net yield from the operation of sponsored routes is about \$0.20 per dollar in Espoo and \$0.35 per dollar in Vantaa. Private bus operators have calculated that the operation of sponsored routes costs roughly 20 percent more than the operation of market routes

because buses and personnel are underutilized and there is additional administrative expense. If this rough calculation is even approximately correct, it helps explain why the Espoo-based companies are reluctant to operate sponsored routes and why there is competition for them in Vantaa. The city-owned company in Vantaa operates the majority of the sponsored routes.

Economic assessment of bus operations cannot be based on the average per-bus kilometer cost because this does not in sufficient measure consider the costs of the resources: the buses and the drivers. Bus transportation requires the purchase of buses, hiring of drivers, and operation of buses over a route. In a simplified way, the costs of bus transportation also vary with buses, driver hours, and bus kilometers driven (2). The passengers pay for these costs, in part or totally, as fares. The subsidy provided by the city or the state is paid by citizens as taxes. The greater the costs of bus traffic and the less the farebox revenue, the greater the taxpayer expense.

Because of heightened interest in profitable bus transportation, the emphasis on its costs and productivity is important and the focus of the remainder of the paper.

UNIT COSTS OF BUS TRANSPORTATION IN HELSINKI REGION

Costs of bus transportation are classified into three groups: those that vary with the number of buses, with the driver hours, and with bus miles driven. The composition of these groups is the following:

1. Costs that vary with the number of buses:
 - a. Vehicle taxes and mandatory and voluntary insurance payments
 - b. Income taxes
 - c. Depreciation of buses, other vehicles, buildings, and equipment; changes in investment reserve fund
 - d. Interest payments
 - e. General overhead expenses such as rental payments, marketing, public relations, vehicle inspections, and taxes
2. Costs that vary with driver hours: wages and benefits
3. Costs that vary with bus kilometers driven:
 - a. Fuel, oil, and coolants
 - b. Tires, spare parts, and other garage expenses
 - c. Work done outside the company (this includes maintenance and repairs done by a private vendor and costs of rented spare buses)
 - d. Wages, salaries, and benefits in the garage

There are other factors that affect costs, but the foregoing classification into three groups is illuminating, and bus operators with whom it was discussed agreed with it.

The unit costs classified into these three groups

TABLE 5 Selected Profitability Indices of Bus Companies in Helsinki Region, 1982

	Private Company	Public Company	HKL	Espoo	Vantaa
Income	92	94	109	97	89
Costs	91	91	184	96	87
Cash flow ^a	22	16	-62	24	17
Share of income financing ^b	0.23	0.17	-0.57	0.25	0.18

Note: Indices given in cents per bus kilometer.

^aIncome minus (costs - depreciation - tax refunds - change in investment reserve).

^bCash flow gross income.

TABLE 6 Unit Costs of Bus Transport in Helsinki Region, 1982

Cost	Private Company	Public Company	HKL	Espoo	Vantaa
Bus [\$(bus) (yr)]	21,914	22,328	24,637	25,704	18,684
Driver hours (\$/hr)	6.33	7.57	7.91	6.39	7.00
Bus kilometers (\$/km)	0.22	0.22	0.53	0.22	0.22

are shown in Table 6. Two things stand out: the significant difference in driver pay between the private and public companies and the large bus kilometer costs of HKL. In the following three sections these unit costs are discussed in detail.

Per-Bus Costs

The cost disaggregation in Table 7 is a weighted average of the bus fleet costs of the companies in a given group. Depreciation is the largest expense. The private companies have the greatest depreciation costs, which are close to the legally permitted amounts. HKL's depreciation costs are low, partly because in the past 4 years no new buses have been acquired and there are no plans to purchase any in the next 2 years. All capital funds are currently committed to the subway.

Excluding depreciation and investment reserves, the expenses of the private companies are over \$3,000 per bus lower than those of the city-owned companies and \$9,000 per bus lower than those of HKL. Why is this? The biggest contributor to the difference is seen to be the administrative salaries, benefits, and other general overhead expenses. These are nearly two times higher in the city-owned companies and three times higher in HKL than in the privately owned firms.

Large expenses for salaries and overhead in the city-managed operations are simply the result of excessive bureaucratization. Their service or marketing activities are not so extensive as to affect personnel size. A good point of reference for these expenses is the number of administrative employees per bus: in private companies, 0.16; in the city-owned companies 0.31; and in HKL, 0.40. This is directly related to administrative costs.

There are differences, of course, among the companies in terms of the cost of salaries. Their percentage share of the per-bus costs varies from 6 to 26 percent, the largest percentage belonging to a private company. Thus, there are opportunities for cost reductions in private and public operations alike.

There are also differences between cities. Excluding depreciation, yearly bus costs of Espoo-based companies are about \$2,000 per bus greater than those in Vantaa. The difference is due to interest payments, taxes, and a newer fleet. The range in the interest payments in the sample firms was from 3 to 15 percent of the total bus costs.

Per-bus costs are often expressed only as equal annual payments consisting of depreciation and interest using the capital recovery factor (CRF). This is approximate at best because allocation of lump sum interest payments and depreciation costs to buses is artificial when the fleets have a varied age distribution. The age distribution in turn depends on the market for used buses, the mutually interdependent conditioning and reconditioning of the current fleet, and the need for depreciation to hold taxes down.

Nonetheless, it is interesting to calculate the annual capital expenses by using the CRF, as shown in Table 8. The average age and the salvage values are group specific and based on data. To make a fair comparison, the same interest rate of 14 percent is used. This rate was determined after discussions with the operators and includes the cost of money and the desired rate of return on investment. For example, the accounting interest rate of 6 percent used by HKL does not include such a rate of return; money cannot even be bought at that rate in Finland.

The reader is asked to draw his own conclusions from the data in Tables 7 and 8. Suffice it to say

TABLE 7 Bus Transport Costs That Vary with the Number of Buses, Helsinki Region, 1982

Item	Private Company	Public Company	HKL	Espoo	Vantaa
Depreciation	11,968	9,211	5,723	14,029	8,603
Administrative salaries and benefits	2,840	5,137	9,630 ^a	3,221	3,731
Interest, taxes, and insurance	4,742	3,714	4,273 ^b	5,167	3,802
General overhead	2,364	4,266	5,011	3,286	2,548
Total	21,914	22,328	24,637	25,704	18,684

Note: Costs are given in dollars per bus per year.

^aApproximate.

^bHKL pays no taxes.

TABLE 8 Bus Capital Costs, Helsinki Region, 1982

	Private Company	Public Company	HKL	Espoo	Vantaa
Purchase price (\$)	104,600	105,550	120,350	104,650	104,650
Salvage value (\$)	7,400	4,600	12,150	9,250	3,700
Life (yr)	8	10	15	6	10
Annual cost (\$)	20,960	19,350	17,600	24,500	19,350

Note: $r = 0.14$.

that the data reinforce the conclusions drawn earlier about bureaucratization in city-managed operations and low or no required rate of return. Again, large intercompany and intracompany variances exist in salvage and resale values and in bus age. Some private firms use up their buses and sell them for scrap, whereas others sell their buses when still new at a good price. Large capital expenses are not necessarily bad: new buses mean riding comfort (which may be reflected in demand), low repair and maintenance costs, and high depreciation and low taxes.

Driver Hour Costs

Driver hour costs are dependent solely on driver hours. The private firms do not explicitly count driver hours and only one company was able to give accurate information. The city-owned companies refused to give this information; HKL kept the best records and made them available.

Driver hours are therefore calculated for each company by using certain rules. When compared with actual costs of one private firm and of HKL, the calculated costs were within 3 percent. Consequently, the method was pronounced good and accurate. The results are given in Table 9. The city-managed operations pay 20 to 25 percent higher than the private firms. HKL is known to have generous retirement benefits, as shown in Table 9.

Related to driver pay and affected by peaking and deadheading is the proportion of effective hours (i.e., hours spent on a bus route) to the total bus

hours. For the private companies this share was 0.60 and for HKL, 0.48.

The total driver wage bill is determined by the number of drivers as well as the pay itself. Opportunities to improve efficiency exist: the number of drivers per bus is 1.37 in private companies, 1.56 for the city-owned companies, and 2.10 for HKL. There also exists a variance in pay scales. The difference between maximum and minimum hourly wages was \$2.25/hr in Vantaa and \$1.25/hr in Espoo.

Per-Kilometer Costs

Table 10 shows the disaggregation of costs that vary with bus kilometers driven. The costs of private and city-owned firms are roughly equal; HKL's costs are 2.5 times greater, which is due in part to the operating conditions in Helsinki--short intervals between bus stops, heavier bus loads, and older buses.

The differences in shop personnel wages and salaries are substantial and not explained by the operating conditions alone. HKL's shop personnel costs are six times those of the private firms. Private firms have the equivalent of 0.16 person per bus in the shop; the city-owned companies have 0.21 and HKL, 0.69.

There is substantial variance in cost items among the companies. For example, in repair and garage costs the difference between maximum and minimum was \$0.054/km, and it was a private firm that had the highest shop personnel costs. In fuel costs the maximum difference was \$0.021/km. Again, the opportunities to make economy improvements range from driving skills to good repair and garage management.

TABLE 9 Driver Salaries, Helsinki Region, 1982

	Private Company	City-Owned Company	HKL	Espoo	Vantaa
Wages	5.13	6.09	5.77	5.15	5.69
Benefits	1.20	1.48	2.14	1.24	1.31
Total	6.33	7.57	7.91	6.39	7.00

Note: Salaries are given in dollars per hour.

Summary

Table 11 shows the cost structure of the bus companies and agencies as a percentage of the total costs. The account for driver wages and benefits is by far the biggest. If depreciation is ignored, the share of driver wages is comparable for all types of operations.

TABLE 10 Bus Transport Costs, Helsinki Region, 1982

	Private Company	City-Owned Company	HKL	Espoo	Vantaa
Fuel and oil	12.4	11.9	19.1	12.4	12.0
Tires, parts, and private vendor work	5.7	5.4	11.5	5.6	5.7
Wages and benefits of shop personnel	3.7	4.3	22.2	3.7	4.1
Total	21.8	21.6	52.8	21.7	21.8

Note: Costs are given in cents per bus kilometer.

TABLE 11 Summary of Unit Cost Structure, Helsinki Region, 1982

	Private Company	City-Owned Company	HKL	Espoo	Vantaa
Fuel and oil	13.6	13.0	10.4	12.9	13.9
Tires, spares, and related work	6.3	5.9	6.2	5.7	6.6
Driver wages and benefits	34.4	40.0	42.2	33.1	39.1
Shop wages and benefits	4.1	4.7	12.1	3.9	4.8
Administrative salaries and benefits	5.4	7.4	11.4	5.6	7.2
Depreciation	22.7	15.0	6.7	24.2	16.3
Interest and taxes	6.5	3.6	2.8	6.7	4.5
Vehicle insurance, taxes, and general overhead	7.0	9.4	8.2	7.9	7.6

Note: Values given are percentages.

TABLE 12 Worker Productivity, Helsinki Region, 1982

	Private Company		City-Owned Company		HKL		Espoo		Vantaa	
	Bus Kilometers per Worker Hour	Employees per Bus	Bus Kilometers per Worker Hour	Employees per Bus	Bus Kilometers per Worker Hour	Employees per Bus	Bus Kilometers per Worker Hour	Employees per Bus	Bus Kilometers per Worker Hour	Employees per Bus
Drivers	18.7	1.37	17.9	1.56	9.5	2.10	18.7	1.44	18.3	1.41
Shop personnel	158.0	0.16	134.5	0.21	30.0	0.69	179.9	0.15	129.7	0.19
Administration	160.8	0.16	90.6	0.31	52.9	0.40	135.8	0.20	125.7	0.21
Total	15.2	1.69	13.5	2.08	6.2	3.19	15.1	1.79	14.2	1.81

It may also be seen from Table 11 that the principal costs are bus depreciation, driver wages, and fuel. This lends further credence to the division of costs into the three groups cited earlier--per bus, per driver, and per kilometer.

PRODUCTIVITY

The unit costs reveal one aspect of bus operations. Worker productivity, demand, and profitability are equally important. In this section some indices of worker productivity are presented. Perhaps the best measure of productivity would be the en-route driver hours divided by total work hours. Such precise data were not available, but rough calculations showed that the average for private companies was 40 percent higher than that for the city-managed operations.

Table 12 shows bus kilometers en route divided by hours worked for three employee groups: drivers, repair and maintenance personnel, and administrative workers (including dispatchers). The data show that the private firms have the highest productivity, but the difference to the city-owned companies is marked only in administration. HKL's productivity is very low in all worker categories, especially those in repair work.

A second production-factor-based measure of productivity, the size of the labor force per bus, is also given in Table 12. These data parallel bus kilometers per hour worked and any differences can be explained by the speed of the buses.

Another angle to productivity, an output measure, is related to demand. The objective of bus transit is to transport people, not to produce bus kilometers. Table 13 shows passenger kilometers per hour

worked for various personnel categories and firm types. It is seen that the differences in productivity between the private and city-owned companies is the same as that measured with bus kilometers as a yardstick.

However, HKL is closing the gap. Private firms drive 145 percent more bus kilometers per worker hour than HKL; the difference in terms of passenger kilometers per worker hour is only 68 percent. This could have been surmised from the load factors and bus speeds. HKL's load factor and passenger volumes are greater and bus speeds are lower than those of the other companies.

Yet a third angle to productivity is the profitability of bus operations, because it is a good indicator of efficiency in the use of resources. Table 14 shows the costs and income per passenger kilometer. The data in parentheses exclude depreciation, taxes, and changes in the investment reserve fund on the cost side; on the income side only fare-box revenue is included. The data in parentheses tell the most about profitability because depreciation does not reflect the cost of buses sufficiently accurately and these data cannot be changed with creative accounting.

The bottom line of productivity indicators is that the private firms are the most productive and the city-owned companies are much more productive than a city transit agency. The same conclusion applies to profitability.

CONCLUSIONS

The cost structure, level of service, and productivity of three types of bus operations have been

TABLE 13 Worker Productivity, Helsinki Region, 1982

	Private Company	City-Owned Company	HKL	Espoo	Vantaa
Drivers	268	257	199	239	288
Shop personnel	2,257	1,927	628	2,299	2,042
Administration	2,297	1,298	1,104	1,735	1,980
Total	217	193	129	192	224

Note: Productivity given as passenger kilometers per worker hour.

TABLE 14 Profitability of Bus Operations, Helsinki Region, 1982

	Private Company	City-Owned Company	HKL	Espoo	Vantaa
Income	7.0 (6.5) ^b	7.6 (7.0) ^b	9.4 ^a (5.6) ^b	8.1 (7.6) ^b	6.3 (5.9) ^b
Expenses	6.8 (5.2) ^c	7.4 (6.3) ^c	9.4 (8.7) ^c	8.1 (5.9) ^c	6.3 (5.2) ^c

^aIncludes subsidy.

^bFarebox income only.

^cExcludes depreciation, taxes, and changes in investment reserve fund.

examined: private firms, city-owned companies, and a city transit agency. It was found that there are differences in all aspects discussed among these three types of companies.

The private firms are the most cost-efficient and productive, as judged by the output measures or indicators used in the study. The private firms also appear most responsive to changes in the travel market and adjust their level of service to market demand. Nonetheless, several of the private firms studied would benefit from closer attention to travel demand patterns and from more knowledge of the market they serve.

The publicly owned or operated firms and agencies appear to have another objective besides efficiency, productivity, and profitability: to maximize patronage and social service, not to minimize subsidy. This begs the question of what purposes and goals are aided by maximized patronage and service. The political pronouncements about inexpensive, accessible public transit are necessarily vague. The large costs of public transit coupled with attendant subsidies behoove that the transportation profession require a deeper and more thorough discussion about the aims and objectives of subsidized public transit to determine whether the same goal may be achievable without subsidies and attendant complex decision-making processes.

Other findings of this paper, that subsidies and even sponsored service contracts lead to increased costs and reduced efficiency, are supported by findings elsewhere. Yet another finding is that profitable public transit, at least in some parts of the Helsinki region, is possible at a good level of service in attractively appointed buses.

Finally, even though no data are shown to support it, a contention is made that economies of scale and productivity studies must consider not only the output measures that reflect the use of the factors of production and the service provided but also the effectiveness of management of the transit firm or agency.

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Passenger Service Times for a No-Fare Bus System

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ABSTRACT

Passenger service times for a no-fare bus system are examined to show how the service time per boarding passenger varies with the size of the boarding group and the number of passengers already on the bus. These relationships are developed for two different occupancy conditions: (a) when the number of passengers on the bus before reaching a stop is less than or equal to the seating capacity of the bus (about 30), and (b) when the number of passengers on board is greater than the seating capacity of the bus (over 30). Simple and multiple regression analyses were performed to examine the effects of bus occupancy and the rank of boarding passengers on the service time per passenger. Both factors were found to influence passenger boarding times. When the number of passengers on the bus exceeded the seating capacity, the service time was more than 2 sec per passenger. When the number of passengers already on the bus was less than the seating capacity, the service time was approximately 2 sec per passenger. The difference in service times stems from the crowded conditions that result when the seating capacity of the bus is exceeded and standing passengers are jostling for position.

The time that a bus spends at a passenger stop represents a significant amount of the total time of its journey. These dwell times affect the quality of service, operating costs, and modal choice, and they vary with the operating environment, the type of

bus, and the type of route. The time buses spend at passenger stops in the United States accounts for about 0.50 min/mi in the suburbs, 1.20 min/mi in the city, and 3.00 min/mi in the central business district (CBD). Delays at passenger stops generally exceed traffic delays in non-CBD areas; both delays are equal in the CBD. Overall, delays at passenger stops account for 9 to 26 percent of the total time of a bus journey (1).