Title
Profiling Profitable Bus Routes

Author
Cervero, Robert

Publication Date
1992-02-01

Profiling Profitable Bus Routes

Robert Cervero

February 1992
Reprint, No. 92

**The University of California
Transportation Center**

University of California
Berkeley, CA 94720

The University of California Transportation Center

The University of California Transportation Center (UCTC) is one of ten regional units mandated by Congress and established in Fall 1988 to support research, education, and training in surface transportation. The UC Center serves federal Region IX and is supported by matching grants from the U.S. Department of Transportation, the California State Department of Transportation (Caltrans), and the University.

Based on the Berkeley Campus, UCTC draws upon existing capabilities and resources of the Institutes of Transportation Studies at Berkeley, Davis, and Irvine; the Institute of Urban and Regional Development at Berkeley; the Graduate School of Architecture and Urban Planning at Los Angeles; and several academic departments at the Berkeley, Davis, Irvine, and Los Angeles campuses. Faculty and students on other University of California campuses may participate in Center activities. Researchers at other universities within the region also have opportunities to collaborate on selected studies. Currently faculty at California State University, Long Beach, and at Arizona State University, Tempe, are active participants.

UCTC's educational and research programs are focused on strategic planning for improving metropolitan accessibility, with emphasis on the special conditions in Region IX. Particular attention is directed to strategies for using transportation as an instrument of economic development, while also accommodating to the region's persistent expansion and while maintaining and enhancing the quality of life there.

The Center distributes reports on its research in working papers, monographs, and in reprints of published articles. For a list of publications in print, write to the address below.

University of California Transportation Center

108 Naval Architecture Building
Berkeley, California 94720
Tel: 415/643-7378
FAX: 415/643-5456

Profiling Profitable Bus Routes

Robert Cervero

Department of City and Regional Planning
University of California at Berkeley

Reprint, No. 92

Transportation Quarterly
Vol. 44, No. 2, April 1990, pp. 183-201

The University of California Transportation Center
University of California at Berkeley

Profiling Profitable Bus Routes

ROBERT CERVERO

Prof. Cervero teaches transportation and land-use planning in the Department of City and Regional Planning at the University of California, Berkeley. He is the author of two books on suburban transportation, Suburban Gridlock *(1986) and* America's Suburban Centers: The Land Use—Transportation Link *(1989). He recently completed a study on competitive contracting of transit services for the Urban Mass Transportation Administration (UMTA) from which part of this article is drawn.*

PROFITABILITY has long eluded America's public transit industry. Today, few transit routes in the nation cover more than one-half of their fully allocated costs through farebox returns.[1] Nor is profitability something that many people expect or even want public transit to achieve. Indeed, mass transit has a much larger social mandate—to provide mobility to the poor, young, old, and indigent; to reduce traffic congestion along heavily traveled corridors, along with fuel consumption and air pollution; to encourage and reinforce relatively dense and environmentally efficient land development patterns; and to provide back-up transportation for even those who normally drive, such as during periods of severe oil shortages.

Interest in improving the fiscal health of public transit has heightened in recent years in the wake of federal subsidy cuts, greater competition from private bus operators, and trends that are apparently shrinking transit's customer base, such as declining real gasoline prices and the suburbanization of jobs. While no one is calling for transit agencies to run in the black, it is encouraging nonetheless that some urban transit routes do make a profit. Given the financial pressures facing America's public transit industry, it is instructive to put these routes "under a microscope" and probe some of their service and ridership characteristics. The aim of this article is to do so.

As part of a larger study on competition in the urban transit sector, profitable publicly operated bus routes were found in three metropoli-

1. Fully allocated costs represent the total cost incurred in delivering a specific service, including direct costs of labor, capital, and material resources and a portion of the shared cost of labor, capital, and materials used in providing service. These costs have been defined by the Urban Mass Transportation Administration in the agency's Private Enterprise Policy (*Federal Register,* 45, no. 205).

TRANSPORTATION QUARTERLY, Vol. 44, No. 2, April 1990 (183–201)

tan areas: Philadelphia, Washington, D.C. and Minneapolis-St. Paul.[2] While profit-making public transit routes surely operate in other places as well, such as New York City, the absence of reliable ridership, operations, and cost data at a route-by-route level restricted the size of the sample frame. In all, data on the highest ridership routes of transit properties in 25 of the nation's largest metropolitan areas were compiled for both local and express bus services. Based on the cost models developed, less than 1 percent of all routes studied were found to cover their fully allocated costs (i.e., generate a profit). The bulk of this article profiles the profitable bus routes in terms of those attributes that appear to effect demand for service.

DEFINING PROFITABILITY

At its simplest level, profitability exists when a transit agency generates revenues sufficient to cover its direct operating costs. Normally, this means an agency receiving enough farebox, advertising, and other receipts to offset its outlays for labor compensation, fuel, materials, and other factor inputs as well as to cover the debt and depreciation it incurred for capital outlays. Historically, U.S. transit properties have received federal and state grants that cover as much as 80 percent of the purchase cost of rolling stock and other capital acquisitions. To a large extent, then, capital purchases are considered to be one-time, sunk investments that are largely underwritten by "others" and thus are often ignored by agencies when assessing the fiscal performance of services. Similarly, overhead expenses, such as for administration, are also usually perceived as sunk and unavoidable, in large part because union pressures and self-survival instincts of transit managers retard efforts to cut back administrative staffs and overhead even when services are reduced, whether through private contracting or elimination of high-deficit runs.

In recognition of these realities, this analysis examines profitability in terms of the degree to which farebox revenues exceed the direct, day-to-day operating expenses that are not sunk and are avoidable should services be abandoned or contracted out to private firms. Adopting the convention used by Pickrell, direct operating expenses include labor, energy, and materials costs for operating and maintaining vehicles as well as use-related depreciation and debt

2. Robert Cervero, *Transit Service Contracting: Cream-Skimming or Deficit-Skimming?* (Washington: Urban Mass Transportation Administration, 1988).

service on any vehicles used in providing services.[3] All outlays for fixed facilities (e.g., repair garages, headquarters) as well as all expenses for administrative functions (e.g., accounting, planning, supervision) are excluded from the analysis. This rather conservative definition of costs most closely matches expenses that would instantaneously be eliminated if a transit agency ceased operating or contracted out a specific set of services. For example, if a transit agency contracted out the operation and maintenance of buses on two specific routes, it would immediately save the labor, fuel, and supply expenses of running those buses and would also be able to reduce its outlays for new vehicle purchases by reassigning buses used on contracted routes to new services or deploying them as backups. The agency's count of administrative workers and its inventory of garages and other fixed facilities would likely be unaffected by the private takeover of these services.[4] In many ways, then, this approach to cost estimation is geared toward evaluating the short-term opportunity costs of public operations of services of vis-a-vis either eliminating them or contracting them out. It should be emphasized that this approach is generous in the sense that it is favorable to showing that some publicly operated services earn profits. To the extent the "other" cost categories were included in the analysis, the likelihood of an agency generating operating revenues that exceed costs would be less.

INVESTIGATING THE INCIDENCE OF PROFITABILITY: METHODOLOGY

This section describes the methodology used for selecting case sites and estimating route-level operating costs.

Selection of Case Sites

Clearly, a prerequisite for making a profit on any transit service is high ridership. By and large, transit services with high levels of patronage are found in large urban areas with enough density and well defined activity centers to form a significant customer base.[5]

3. Don Pickrell, *Is There Any Cream to Skim? An Analysis of Urban Transit Costs and Revenues by Type of Service* (Cambridge: Center for Transportation Studies, Massachusetts Institute of Technology, 1986).

4. In the long run, the potential cost savings of contracting carried out on a large scale could create increments of savings to the public sector that are "lumpy" and substantial enough to induce a scaling back of administrative functions and the overall physical plant.

5. Boris Pushkarev and Jeffrey Zupan, *Public Transportation and Land Use Policy* (Bloomington: Indiana University Press, 1977); Edward Morlok and Philip Viton, "Self-Sustaining Public Transportation Services," *Transportation Policy and Decision-Making* 1 (1980): 169–194.

Accordingly, this analysis limited the case sites to U.S. public transit properties with 1987 fleets of 75 or more motor buses based on UMTA Section 15 published statistics—76 transit properties in all.[6]

Since it was expected that public transit routes that cover relatively high shares of costs through the farebox are limited to heavily patronized ones and in order to keep the number of data cases manageable, data were sought only on the highest ridership routes for the case sites. In all, 25 of the eligible agencies were found to operate both all-day local and peak-only express services and to disaggregate operating data on a route-level basis. A database made up of 75 express routes and 75 all-day local routes was created from the 25 selected transit properties. The database consisted mainly of Fiscal Year 1987 route-level statistics on average daily operating costs, farebox revenue, ridership, and service inputs (e.g., vehicle miles).

Estimating Route-Level Operating Costs

While fairly accurate records are maintained on the daily revenue receipts of a transit property's routes, comparably detailed data are rarely available on the cost end. In all cases, the route costs provided by transit agencies were estimates, not actual measured costs. For a host of reasons, transit properties do not maintain accounts on the actual costs of operating individual routes. One major reason is that since bus drivers accrue different wage rates depending on their years of service, the costs of any one route would largely depend on how driver tours were assigned and rotated. Logically, "average" labor costs should be associated with each route. Additionally, since buses are sometimes interlined, or switched from one route to another during the day, assigning maintenance costs to particular routes can be problematic. Furthermore, administrative and supervisory costs cannot be easily apportioned among numerous routes for which a manager is responsible. Even fuel costs are difficult to assign to a particular route; while a route's daily mileage is usually known, varying traffic conditions and ages of vehicles affect the fuel efficiencies of different routes. To compile accurate cost data on each route, moreover, would require a highly elaborate accounting system that would likely be prohibitively expensive and yield somewhat dubious results since cost inputs (e.g.,

6. Urban Mass Transportation Administration, *National Urban Mass Transportation Statistics: 1987 Section 15 Annual Report* (Washington: U.S. Department of Transportation, Urban Mass Transportation Administration, 1988).

drivers' wages) vary among routes. For all of these reasons, route-level operating costs are more often than not estimated by breaking down a transit agency's annual operating costs, a practice normally known as "cost allocation."

Route-level cost allocation methods range from simple unit cost estimates based on a single variable to fairly complex multivariable models.[7] Typically, expense items are segregated into subcategories such as labor, maintenance, and fuel. Subcategories are then stratified among several variables, such as vehicle hours or vehicle miles of service, which are considered causally linked to the encumbrance of expenses in each subcategory. A multivariable equation can then be derived by calculating a unit coefficient for each factor of production (e.g., by dividing the total cost of all subcategories by, say, vehicle miles).

In order to maintain consistency in the estimation of costs, a uniform cost allocation model was developed for each of the 25 transit properties studied. Again, only direct, day-to-day costs were estimated, which meant the exclusion of administrative overhead cost and all capital expenditures except those directly related to usage, such as the depreciation of rolling stock.

Three input factors used in estimating costs for each of the 25 agencies were: (1) daily total (in-service and out-of-service) vehicle miles; (2) daily total (in-service and out-of-service) vehicle hours; and (3) number of vehicles operating during the peak period. The three input factors were assumed to be causally linked to the following costs:

- *Vehicle Hours:* transportation administration; revenue vehicle movement control; scheduling of transportation operations; and revenue vehicle operation (primarily drivers' wages and fringe benefits).
- *Vehicle Miles:* vehicle maintenance administration; inspection and maintenance of vehicles; accident and vandalism repairs; and maintenance to vehicle movement control systems.
- *Peak Vehicles:* servicing revenue vehicles (chiefly fuel and lubrication); maintenance of fare collection equipment; ticketing and fare collection; and insurance.

7. James Miller and John Rea, "Comparison of Cost Models for Urban Transit," *Highway Research Record 435* (1973): 11-19; Herbert Levinson, "Peak-Off-Peak Revenue and Cost Allocation Model," *Transportation Research Record 663* (1978): 29-33; Robert Cervero, "Multistage Approach to Estimating Transit Costs," *Transportation Research Record 887* (1982): 67-75.

TABLE I—BUS ROUTES WITH COST RECOVERY RATIOS ABOVE 1.0

Transit Agency	*Route Name*	*Cost Recovery Ratio*[a]	*Profit per Rider*
WMATA	Benning Road	2.21	$0.44
SEPTA	33	1.65	0.30
SEPTA	52	1.52	0.26
SEPTA	C	1.44	0.23
WMATA	Pennsylvania Avenue	1.37	0.22
WMATA	Georgia/7th Streets	1.27	0.17
MTC	21	1.10	0.06

a. Cost recovery ratio = passenger revenues divided by estimated operating costs.

Thus, three-factor cost models were derived for all six routes studied for each of the 25 transit properties using these cost allocation procedures.[8]

LEVEL OF PROFITABILITY

Merging daily passenger revenue and estimated operating cost of each route studied yielded an index of profitability. A recovery rate above one indicated a profit was being generated while a rate below one signified a deficit was being incurred.

Table I lists the 7 high-patronage publicy operated bus routes that were found to make a profit. In all, only 7 of the 152 routes examined in this study, or 4.6 percent, were found to either make a profit or break even.[9] These 7 routes all involved all-day, local (non-express) operations and were split among 3 of the 25 case study transit agencies; the Southeast Pennsylvania Transit Authority (SEPTA) serving the greater Philadelphia area, with 3 profitable routes; the Washington Metropolitan Area Transportation Authority (WMATA), also with 3 money-makers; and Minneapolis's Metropolitan Transit Authority (MTA), with 1 profitable route.

Overall, very few of the public transit routes studied were found to clear a profit. Given that the 25 case study transit systems had a combined total of 1,310 fixed routes, then the 7 profitable routes comprised less than 1 percent, or 0.0053, of total routes in operation. It bears repeating that the cost models used were fairly conservative. If administrative and total capital costs attributable to each route were included in the analysis, then the number of profitable routes would

8. Cervero, *Transit Service Contracting: Cream-Skimming or Deficit-Skimming?* pp. 29–30.

9. In the original research, 10 routes were actually found that made a profit or broke even. Two of these routes were peak-only express services and one was operated by a private franchise. Since the focus of this article is on conventional all-day bus operations, only 7 of the profitable routes are discussed.

have likely been far less. Thus even when a conservative approach to estimating costs is adopted, fewer than 1 percent of the nation's fixed-route transit services are estimated to make a profit. In regards to the cream-skimming charges that are frequently leveled against competitive contracting of transit services, there appears to be very little potential "cream to skim."[10] Rather, any conversion of transit services from public to private sector delivery in the United States would in almost all cases involve "deficit-skimming."

CHARACTERISTICS OF PROFITABLE BUS ROUTES

The remainder of this article probes what factors might account for the profitability of the seven stellar routes. Emphasis is placed on the demand side of the equation—how sociodemographic factors, urban land uses, and the geographic distribution of residences and employment might be giving rise to high levels of demand and thus profitable services. While costs certainly vary as a function of operating conditions, for the most part input costs are incurred at a similar rate within a transit agency (e.g., roughly the same cost per gallon of fuel or 10,000 miles of wheel tread wear). Since all three agencies charge more or less a flat fare for their bus services, generally distinguishing fares between express and local bus services and exacting a small peak surcharge, the effects of pricing structures on profitability are not directly considered. Rather, the analysis focuses on demand-side influences, most of which are exogenous and thus outside a transit agency's direct control—namely, user demographics, spatial patterns of urban activities, and land-use densities.

The following sections describe some of the key demand-side features of the profitable routes operated by SEPTA, WMATA, and MTC. As a prelude, Table II presents summary performance statistics for each route.

Southeast Pennsylvania Transportation Authority

SEPTA is the regional transit operator for Philadelphia and its Pennsylvania suburbs. It is the fifth largest transit system in the country, with a fleet of about 1,100 motor coaches operating along 108 bus routes. Besides conventional motor bus services, SEPTA also operates streetcars, electric trolley buses, elevated and underground rail

10. The cream-skimming argument holds that under free competition, private entrepreneurs will take away money-making services, leaving public transit agencies with the money losers and higher operating deficits.

TABLE II—SUMMARY PERFORMANCE STATISTICS FOR THE SEVEN PROFITABLE ROUTES

		Average Daily			*Cost Recovery*	*Average Cost per*		
Agency	*Route*	*Riders*	*Revenues*	*Cost*	*Ratio*	*Mile*	*Hour*	*Rider*
SEPTA	C	30,951	$23,213	$16,074	1.44	$3.63	$31	$0.52
	33	18,186	$13,640	$ 8,272	1.65	$4.46	$28	$0.45
	52	17,670	$13,252	$ 8,725	1.52	$3.01	$19	$0.49
WMATA	Benning Road	21,272	$17,017	$ 7,701	2.21	$4.43	$42	$0.36
	Pennsylvania Avenue	23,116	$18,493	$13,471	1.37	$4.33	$43	$0.58
	Georgia/7th Streets	16,928	$13,542	$10,639	1.27	$4.76	$42	$0.63
MTC	21	15,231	$10,304	$ 9,404	1.10	$3.62	$36	$0.62

Sources: Unpublished agency reports for Fiscal Year 1987.

transit, and heavy rail commuter trains. In 1987, SEPTA carried around 200 annual unlinked passenger trips, serving a district with a population of approximately 4.7 million persons. SEPTA charges a basic local fare of $1.25 for bus and trolley, plus 30 cents for each suburban zone that is crossed. For the system as a whole, SEPTA recovered 47 percent of its 1987 fully allocated operating costs through passenger fares.

Three of SEPTA's routes were found to generate a profit: Routes C, 33, and 52. Figure 1 maps these routes, along with some of the major activity points along each route. Two of the routes, C and 52, connect low-income minority neighborhoods with downtown Philadelphia and other employment centers. The third route, 52, runs entirely within several low-income, mixed residential-commercial neighborhoods in predominantly black West Philadelphia. Table III and Figure 2 show that SEPTA's three money-making bus lines traverse neighborhoods with average household incomes well below the city's average and with relatively large minority concentrations. All three profitable routes, moreover, cover fairly long distances and average frequent headways (as short as 4 minutes during the peak and 10 minutes during off-peak along trunk-line segments). Frequent boardings and alightings yield relatively high passenger counts per vehicle mile—8.9 to 10.8, generally around 40 percent higher than SEPTA's systemwide average. As shown in Table IV, high densities also characterize the corridors of each route. Transit-dependency, short-haul trip-making, and dense land uses thus appear to be key factors behind the financial successes of SEPTA's three profitable routes.

Route C. Route C is a long-distance north-south line, connecting the Cheltenham Mall at the city's northern boundary with the Philadelphia Naval Shipyard at the city's southern edge. From the

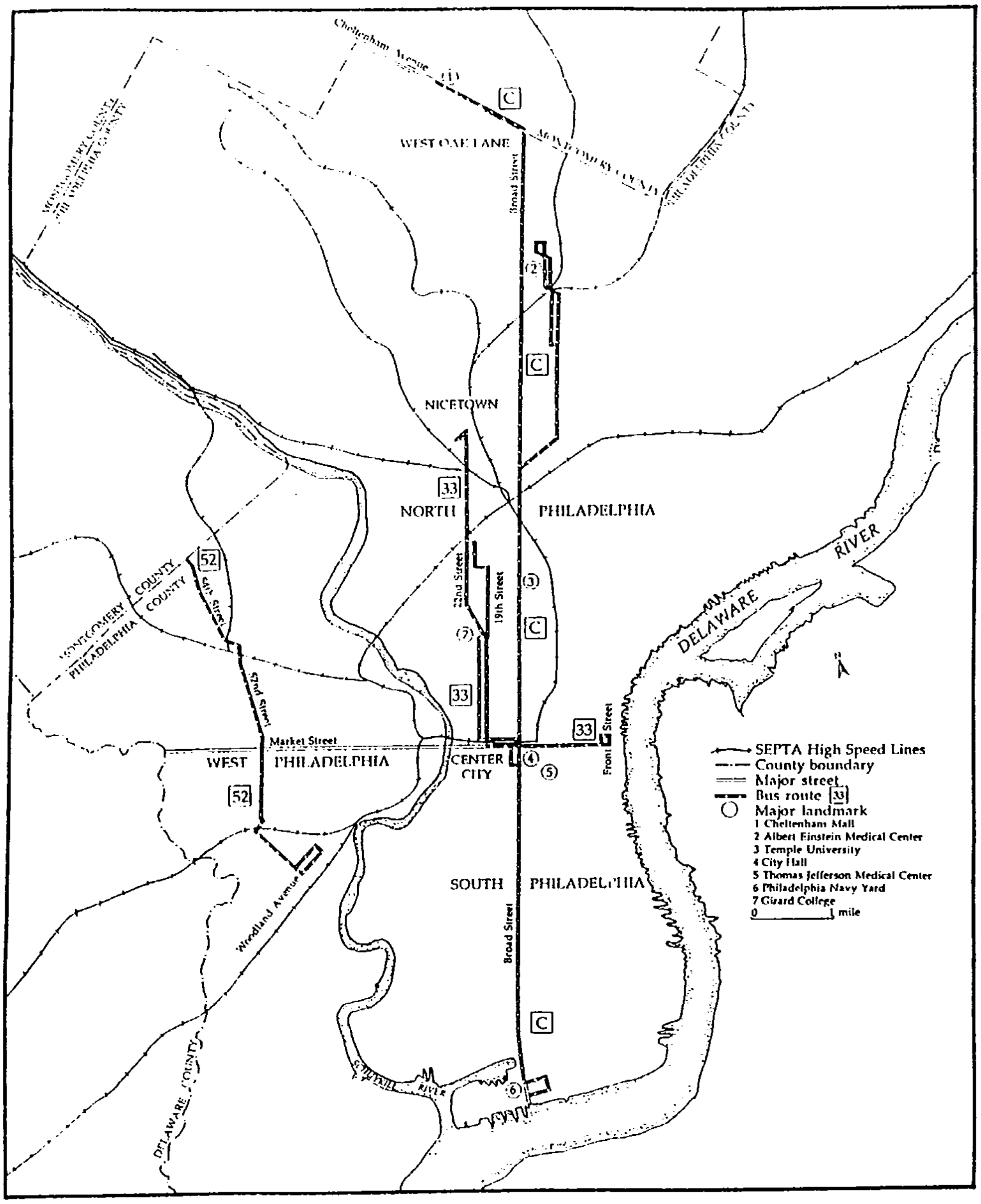

Figure 1. Locations of SEPTA's three profitable bus routes

north, Route C runs along Broad Street, Philadelphia's principal north-south arterial. It passes through largely black residential neighborhoods in North Philadelphia, through Chinatown, skirts Temple University, and then proceeds to the western portion of downtown. The route continues through a number of commercial corridors and residential clusters in the southern half of the city, paralleling the Delaware River for much of its path. In addition to downtown and the Naval Shipyard, Route C also interlinks several medical centers,

TABLE III—AVERAGE INCOME FOR SEPTA'S THREE PROFITABLE ROUTES AND AT-LARGE SERVICE AREA

	1980 Median Income per	
	Household	*Capita*
Route C	$14,082	$6,105
Route 33	13,455	6,387
Route 52	13,137	4,582
SMSA	21,192	7,458
Philadelphia City	16,258	6,053

Note: Bus route data are based on averages computed from all census tracts that are traversed by or directly border each route. SMSA signifies the Standardized Metropolitan Statistical Area for greater Philadelphia.
Sources: U.S. Bureau of the Census, *1980 Census of Population and Housing* (Washington: U.S. Department of Commerce, 1983); Delaware Valley Regional Planning Commission, *1986 Municipal Population Estimates and 1985 Per Capita Money Income Estimates* (Philadelphia: Delaware Valley Regional Planning Commission, 1988).

schools, retail plazas, and commuter rail stations. Veteran Stadium, the city's professional sports facility, is also served by Route C.

Table III shows that the median 1980 household income for the census tracts served by Route C was about one-third less than that of the Philadelphia metropolitan area at-large.[11] Average residential densities, moreover, are 86 percent higher than for the city as a whole (Table IV). From Figure 2, it is seen that 55 percent of the immediately adjacent population served by Route C is non-white, compared to 42 percent of the city's population. High densities and high shares of transit-dependent residents have given rise to an average count of 8.8 passengers per vehicle mile on Route C, compared to around 6.4 for SEPTA's entire bus operations.

Route 33. This route, around four straightline miles in length from end-to-end, connects several residential neighborhoods in North Philadelphia with the waterfront on downtown Philadelphia's eastern edge. Like Route C, Route 33 crosses a number of SEPTA bus routes and commuter rail stations along its stretch.

Tables III and IV show the degree to which neighborhoods along Route 33 are more transit-dependent and denser than the region at-large: median household incomes are around 37 percent below the metropolitan average, average residential densities are around 38 percent higher than those of the city, and average employment densities are nearly 5 times as high. Because of the relatively short-haul travel, moreover, Route 33 averages 10.7 passengers per vehicle mile, a rate that is two-thirds higher than SEPTA's overall average. Finally,

11. In all of the analyses, the census tracts served by a bus line are considered to be those traversed by or directly bordering the route.

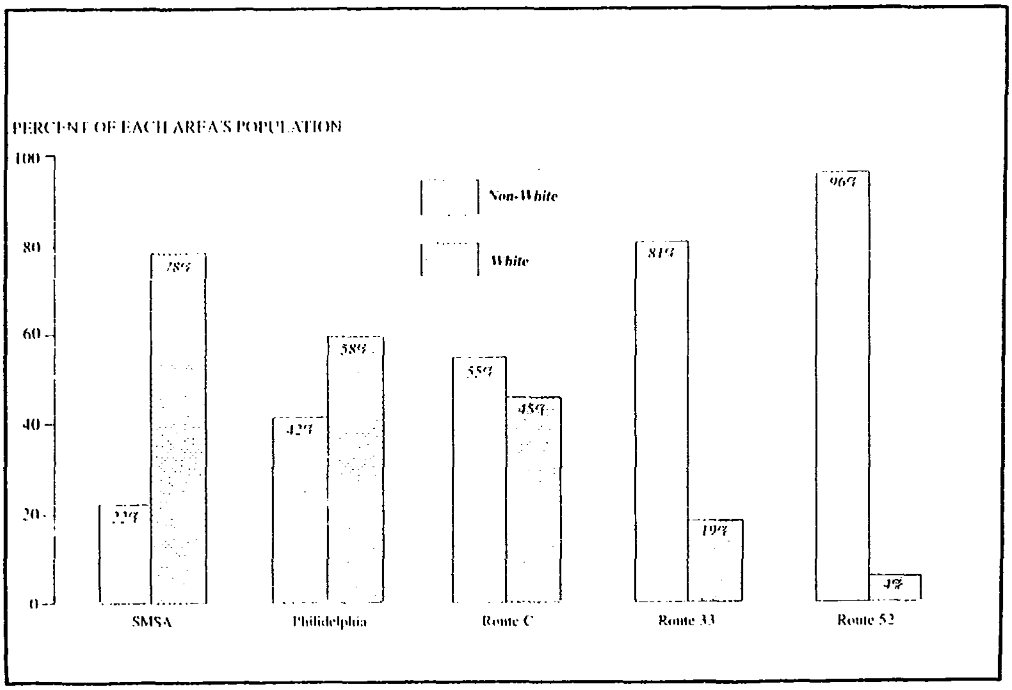

Figure 2. Percent white and non-white households along SEPTA route corridors

over 80 percent of residents living adjacent to Route 33 are non-white, a far greater proportion than for the city or SMSA.

Route 52. This route, around four lineal miles in length, runs in a northwest to southeast direction in a part of the city made up almost entirely of black households. The central part of the corridor is dotted by small retail shops, wholesaling, and some light industry. The southern terminus, at Woodland Avenue, serves a mixed-use neighbor-

TABLE IV—RESIDENTIAL AND EMPLOYMENT DENSITIES ALONG SEPTA'S THREE PROFITABLE ROUTES AND IN PHILADELPHIA

	Population per Acre	*Households per Acre*	*Employment per Acre*
Route C	39	16	38
Route 33	29	11	49
Route 52	45	15	5
Philadelphia City	21	8	10

Note: All data are for 1980 and are based on averages computed from all census tracts that are traversed by or directly border each route. Densities are net of public lands, parks, open space, and restricted-use areas. SMSA signifies the Standardized Metropolitan Statistical Area for Greater Philadelphia.
Source: Delaware Valley Regional Planning Commission, *1986 Municipal Population Estimates and 1985 per Capita Money Income Estimates* (Philadelphia: Delaware Valley Regional Planning Commission, 1988).

hood near the Schuylkill River. Unlike the other two routes, Route 52 operates around-the-clock 7 days a week.

As shown in the preceeding tables and figures, Route 52's immediate service area registers the lowest average incomes, highest shares of minorities, and highest average population densities of any of the profitable routes studied. Population densities, in fact, are more than double Philadelphia's average. Per capita income along the corridor is only around 60 percent of the regional average. Based on boarding-alighting surveys conducted by SEPTA, the average trip length of 2.2 miles along Route 52 is roughly one-half the system's average. In summary, then, a large population of captive users making short-hop trips along a fairly dense residential and mixed-use corridor has enabled Route 52 to cover 152 percent of its costs through the farebox.

Washington Metropolitan Area Transit Authority

WMATA, with a fleet of over 1,500 motor coaches, operates the fourth largest regional bus enterprise in the nation. Serving the District of Columbia, northern Virginia, and suburban Maryland, WMATA formally began operations when four different private bus companies were acquired in 1973. Annual ridership has grown from 116 million to over 200 million since public acquisition and expansion of services. Besides its 1,500-plus buses, which operate on over 400 basic bus routes, WMATA operates a rapid rail system, serving over 350,000 passengers per weekday on the 60-mile system. In 1987, WMATA met 48 percent of its bus operating costs through fares, a relatively high recovery rate by national standards. Currently, the local bus fare within the District is 75 cents, plus a zonal surcharge for crossing suburban districts or state boundaries. A 5-cent surcharge is also collected during peak hours.[12]

Three of WMATA's all-day local routes were found to generate a profit: Benning Road, Pennsylvania Avenue, and Georgia/7th Streets. Benning Road was, by far, the most profitable route studied, returning over twice its direct, day-to-day operating costs through the farebox. As shown in Figure 3, all three of WMATA's profitable routes connect predominantly residential areas of the District to major government offices, commercial centers, and Metrorail stations along some of the city's principal arterials.

12. Peak surcharges are also collected on zonal fares. During rush hours, Metrobus fares range from 80 cents to $2.50, depending on distance traveled. During the off-peak, they range from 75 cents to $1.60.

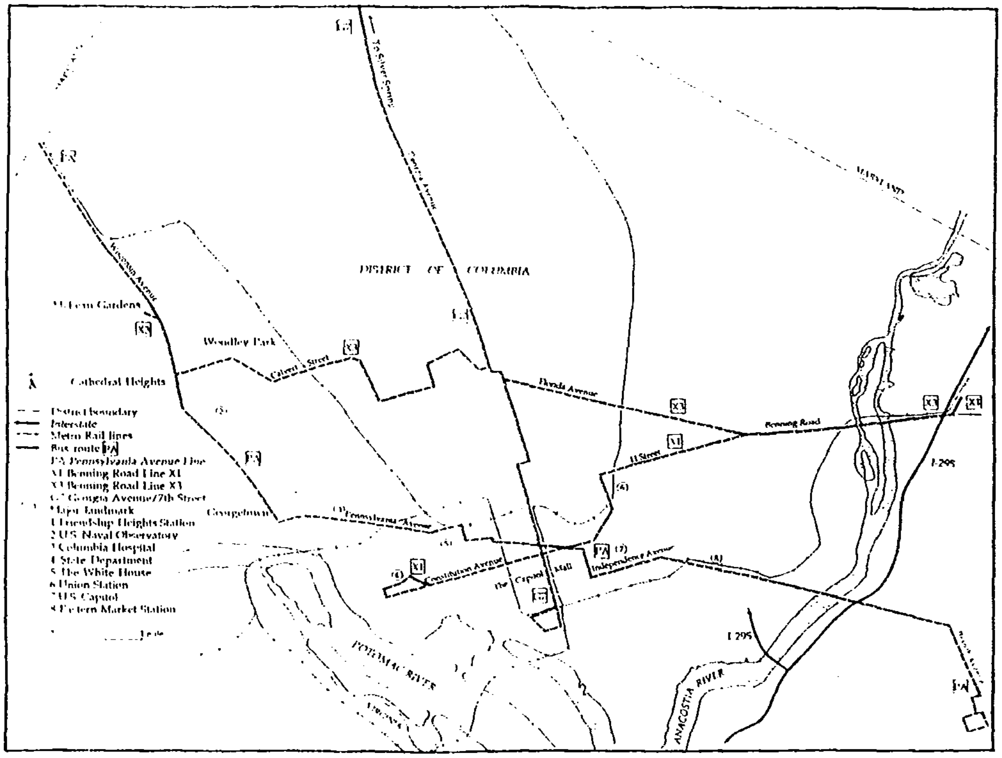

Figure 3. Locations of WMATA's three profitable bus routes

Tables V and VI, along with Figure 4, summarize some of the major demographic and density characteristics of WMATA's three profitable routes in relation to the District as a whole. While the Benning Road and Georgia/7th Street lines clearly serve high shares of minority and low-income households, the Pennsylvania Avenue route is of a different character. WMATA's Pennsylvania route serves corridors with high densities, high average incomes, and high shares of non-whites. In general, the route caters to professional and federal

TABLE V—AVERAGE INCOME FOR WMATA'S THREE PROFITABLE ROUTES, WASHINGTON, D.C., AND SMSA

	1980 Median Income per	
	Household	*Capita*
Benning Road	$18,765	$7,445
Pennsylvania Avenue	26,703	14,228
Georgia/7th Streets	20,170	8,469
SMSA	27,837	10,249
Washington, D.C.	21,982	8,960

Note: Bus route data are based on averages computed from all census tracts that are traversed by or directly border each route. SMSA signifies the Standardized Metropolitan Statistical Area for the Greater Washington, D.C. area.
Source: U.S. Bureau of the Census, *1980 Census of Population and Housing* (Washington: U.S. Department of Commerce, 1983).

TABLE VI—RESIDENTIAL AND EMPLOYMENT DENSITIES ALONG WMATA'S PROFITABLE ROUTES AND IN WASHINGTON, D.C.

	Population per Sq. Mile	*Households per Sq. Mile*	*Employment per Sq. Mile*
Benning Road	15,489	6,371	18,663
Pennsylvania Avenue	11,396	11,795	23,733
Georgia/7th Streets	13,790	5,941	13,672
District of Columbia	10,967	4,506	11,993

Note: All data are 1986 projections derived from the 1980 census and are based on averages computed from all census tracts that are traversed by or directly border each route. Densities are estimates based on usable space which excludes lakes, public parks, and other non-developable areas.
Source: Washington Metropolitan Council of Governments. *Round IV Forecasts: Population, Households, and Employment* (Washington: Washington Metropolitan Council of Governments, 1988).

employees headed to government offices and other job centers, as well as other activity nodes (such as George Washington University) concentrated along Pennsylvania Avenue. In the case of all three profitable routes, peak-period load factors exceed 1.5, while off-peak passenger loads consume between 70 and 90 percent of capacity, on average. Thus, high densities and a cluster of activities along the corridor have led to profitable operations in the case of the Pennsylvania Avenue route, whereas the high incidence of transit-dependency

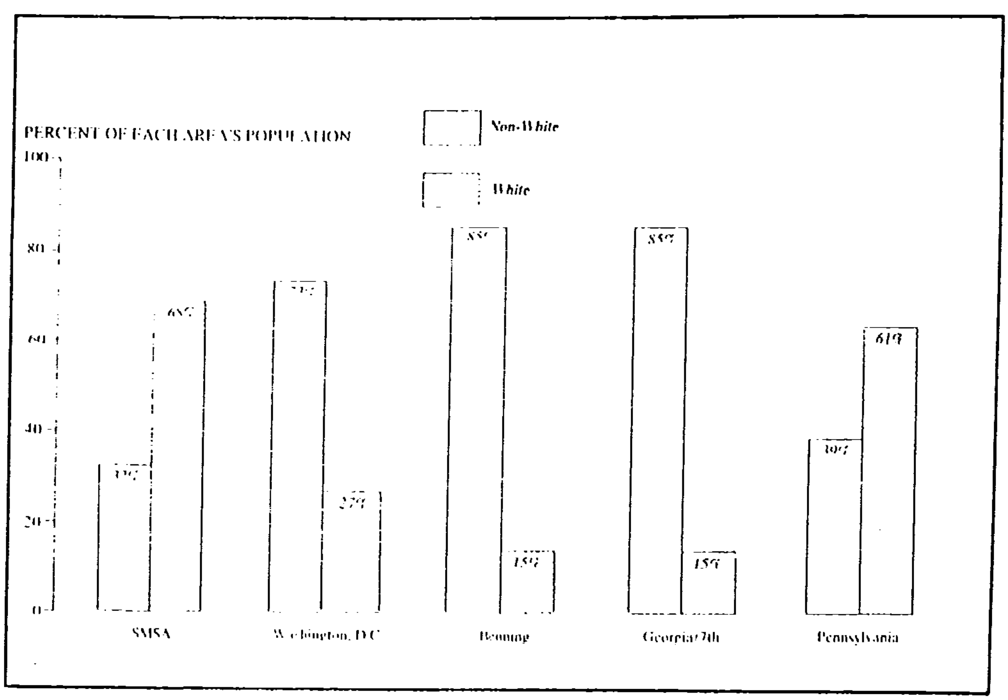

Figure 4. Percent white and non-white households along WMATA route corridors

has ostensibly led to the financial success of the Benning Road and Georgia/7th Street lines.

Benning Road. WMATA provides extensive service on its Benning Road line, which consists of several sub-routes, each of which branches off to various centers such as the Federal Triangle government complex, Amtrak's Union Station, and the Capitol Heights Metrorail station.

From Table V and Figure 4, it is seen that median household incomes along the corridors served by Benning Road are comparatively low, while the share of minority households is relatively high. Table VI, moreover, reveals that both residential and employment densities markedly exceed the District's average. On a census tract by census tract basis, the number of jobs are fairly evenly dispersed along the Benning Road corridor. Although average trip length data were not available for the Benning Road line, it is likely that a sizeable number of employed riders make short trips since zones with the most jobs also tend to be the ones with the most housing units. During interviews, several WMATA officials stated that the high board-alighting counts along certain segments of the route likely reflect a high incidence of short-haul trip-making. With high turnover, WMATA is able to continually re-sell bus seats along the Benning Road corridor, apparently at a very high profit margin.

Georgia/7th Streets. This line connects the Silver Spring, Maryland Metrorail station north of the District with the L'Enfant Plaza Metrorail station near a cluster of federal offices. Formerly a streetcar route, the line has operated along Georgia and 7th Streets for over 50 years and has become a firmly entrenched service. Neighborhoods along the northern portion of the route are made up primarily of low-income households interspersed by light retail. Service operates nearly around-the-clock 7 days a week, with peak headways of 8 minutes and off-peak headways of 14 minutes.

As with the Benning Road line, the Georgia/7th Street line serves a population with appreciably lower average incomes and that reside at higher average densities than the typical District resident. Although average trip distances appear to be a little longer than those of the other two profitable WMATA routes, the Georgia/7th Street line also averages a high peak-hour load factor of 1.4 and off-peak load factor of 0.78.

Pennsylvania Avenue. WMATA's Pennsylvania Avenue line dissects the heart of the District, traversing a historically significant corridor consisting of colonial townhouses, stately government buildings, mid-rise office towers, modern retail centers, and public plazas. Beginning near the Maryland border, the route runs through several upscale neighborhoods and commercial districts before turning east along Pennsylvania Avenue. After passing several middle-income neighborhoods, it connects to the core of District, including the Federal Triangle complex, Capitol Mall, and the Lafayette Square area. In all, five Metrorail stations are directly served by the route.

For the most part, the residential neighborhoods that surround the Pennsylvania Avenue line shatter the stereotype developed so far that profitable routes mainly serve highly transit-dependent populations. On average, household incomes along the corridor are one-quarter higher than the regional average. High on and off counts made by WMATA's corp of route checkers along Pennsylvania Avenue suggest that average trip lengths are generally short, probably in the 1.5 to 2 mile range. Overall, the lesson offered by the Pennsylvania Avenue line is that a profit can be generated even along corridors populated by non-captive riders as long as numerous high-density activity centers are inter-connected and most trips are short in length. Restricted parking and the high cost of vehicle ownership in the District no doubt partly account for the financial success of this and other inner-city WMATA routes as well.

Metropolitan Transit Commission

MTC operates an active fleet of over 950 motor buses on 129 fixed routes serving Minneapolis, St. Paul, and surrounding suburbs. Created in 1967 to take over operations of a fledgling private transit system, the agency's role has grown to the point where today it serves more than a dozen municipalities within a 15-mile radius of downtown Minneapolis on a contract basis. MTC's monthly ridership presently stands at around 6 million. In 1987, MTC recovered about one-third of its operating costs through farebox receipts. MTC's basic bus fare is 60 cents, plus a 15-cent surcharge for peak-hour travel. The highest fare is $1.25 for peak-hour express travel.

One of MTC's all-day local routes, the 21 line, was found to cover its day-to-day operating costs from passenger revenues. Some of the pertinent features of this route are outlined below.

Route 21. Route 21 runs in an east-west direction, connecting a minority neighborhood south of downtown Minneapolis, across the Mississippi River, to downtown St. Paul (Figure 5). The route has a

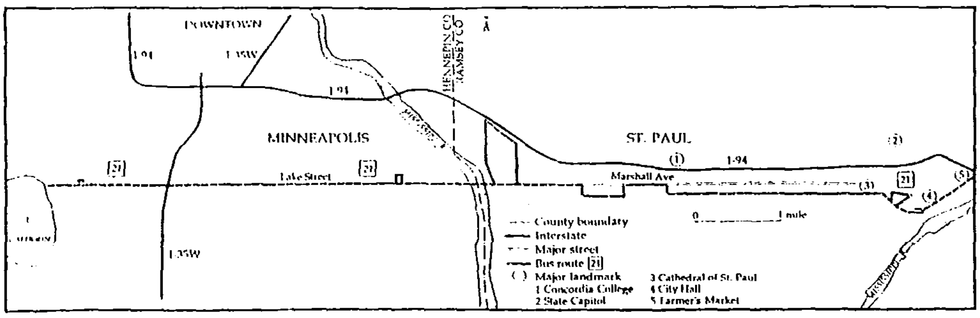

Figure 5. Location of MTC's Route 21

long ridership tradition. It began as a streetcar line in 1905 and has attracted a loyal following of customers ever since. Because of the Lake Street Bridge's structural deficiencies, Route 21's buses do not presently cross the Mississippi River, rather, passengers must transfer to a special shuttle to span the bridge.[13] Despite this inconvenience, passenger loads remain quite high along the 10-mile route.

Like most profitable routes identified so far, Route 21's high patronage levels and financial success stem, in large part, from the highly transit-dependent population it serves. A 1983 MTC on-board survey showed that the route served riders with the lowest income profile of any other route; 43 percent of riders lived in households with annual incomes below $10,000. The 1980 median household income of census tracts directly served by Route 21 or else contiguous to it, moreover, was found to be $16,800, 30 percent below the regional average. Additionally, approximately 21 percent of residents living in these nearby neighborhoods were non-white, compared to 10 percent for the city of St. Paul and 13 percent for the city of Minneapolis.

Finally, the on-board survey showed that Route 21's passengers average relatively short trips, despite the route's 10-mile length. The mean trip distance on Route 21 is only 3.4 miles, below MTC's average of 4.5 miles. This average, however, is inflated by a small number of passengers who travel over 10 miles. Over one-third of Route 21's customers travel between 2 and 3 miles, and nearly 15 percent travel under 1 mile. As with other local bus routes analyzed, short-haul journeys, when coupled with high load factors, produce enough per-mile revenues for Route 21 to operate in the black.

13. The analysis for Route 21 was based on cost data collected for 1986, the year prior to the initiation of the shuttle bus service. Thus, no cost adjustments were needed to account for the operation of a connecting shuttle service.

CONCLUSION

This article has focused on characteristics of profitable public bus routes that appear to affect the demand for transit travel. With few exceptions, profitable routes share a number of common characteristics.

First, they serve highly transit-dependent populations, as evidenced by the low median incomes and high shares of minority residents along the neighborhoods they dissect. In general, median household incomes in neighborhoods abutting these profitable routes are between 20 and 40 percent lower than those of the principal city served by the public transit system.

Second, population and employment densities are consistently high along profitable corridors, anywhere between 30 percent and 80 percent above the net densities of the principal city served by the public transit system. Equally important, profitable routes usually connect the region's central business district, serving a number of employment clusters and major activity centers along the way.

Third, average trip lengths tend to be quite short along profitable routes, generally in the range of 2 to 3 miles. Such high rates of seat turnover produce high revenue yields, especially under flat fare systems.

Fourth, all successful routes average high load factors, generally well over 1.2 during the peak period and in the range of 0.70 and 0.90 during most of the mid-day.

The finding that profitable and high-return bus routes often consist of low-income, minority residents making short-haul trips raises important policy questions. Under the customary flat fare arrangement, those making short trips are to a large extent cross-subsidizing the journeys of those making longer ones.[14] The incidence of this cross-subsidy is clearly regressive when short-distance users average fairly low income, as in the case of the routes cited in this article. To some extent, then, the high fare returns per mile of travel generated by profitable routes are used to cover the low revenues (and high deficits) per mile of travel incurred by long-haul suburban routes, many of which are express operations. A fairer arrangement would be to introduce distance-based fares that would lower the cost of short trips and raise the cost of longer ones. While this would likely cause most of the money-making routes to fall below the break-even mark, at

14. Robert Cervero, "Transit Cross-Subsidies," *Transportation Quarterly* 36, 2 (1982): 377–389.

the same time the deficit level of surburban routes would fall. Thus, distance-based pricing could increase the overall cost recovery rate of a transit agency while reducing the regressivity of flat fare policies.

In close, profitable routes have none of the characteristics of the kinds of services that would be most subject to competitive contracting. No case exists where transit managers have contracted out routes with high load factors serving short-haul trips along dense corridors with transit-dependent households.[15] Rather, competitive contracting of fixed-route transit services, as practiced to date, has been limited primarily to new, start-up services targetted at low-density suburban markets.[16] Thus, the gap between the contentions of the "cream-skimming" argument and the reality of contracting to date seems fairly wide. The kinds of fixed-route services that might conceivably be contracted out to private firms would not encompass the markets that are served by the profitable routes profiled in this article. Rather, such routes will unquestionably remain under public operations in coming years since there is little compelling logic to turning them over to private operators. Very simply, they form the "bread-and-butter" services to the public agencies that operate them.

Acknowledgement

This article is based on results of a research project supported by a University Research grant from the Urban Mass Transportation Administration. The assistance of John Greitzer in conducting this research is gratefully acknowledged.

15. Cervero, *Transit Service Contracting: Cream-Skimming or Deficit-Skimming?* pp. 66–74.

16. Roger Teal, "Transportation Privatization: Experiences and Issues," *Urban Resources* 4, 1 (1986): 7–12.