THE COSTS OF PRIVATE AUTOMOBILE USAGE TO THE CITY OF SAN FRANCISCO

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A history of literature exists directed at the question of whether the automobile pays for itself or not. The apparently conflicting results of these studies is the result of a number of factors, of which the most important are differences in user charges operative at different points in time, differences in the accounting framework used, and differences in what costs are included.[1] If an attempt were made to summarize current thought, it would probably show that user charges are believed to cover all capital costs, most operating costs, and none of the elusive external costs.

San Francisco data indicate that in that city auto users fall far short of covering even operating costs, and that the money costs to the City to provide services to auto users exceeds revenues for these purposes by about fifty percent. A policy which would correct this deficit would require, by way of example, a thirteen-cent increase in the state gasoline tax plus a twenty-dollar increase in the annual registration fee (assuming all of this went to the City). External costs such as air and noise pollution are not estimated here, nor are congestion tolls, but a proper

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[1] Roughly two schools of thought emerge: those that believe highway user charges are adequate as they are, with possibly some spatial redistribution called for, and those that think user charges ought to be raised substantially. The former group focus primarily on capital costs, use accounting data of the type presented here, and include Meyer, Kain and Wohl [9], Bielak and McCarthy [1] and St Clair [36]. The latter group are concerned with problems of peak-load pricing, rely on welfare theory for the derivation of results, and include Mohring [10], Strotz [37], Walters [42], Netzer [14], and Vickrey [41]. Most of these advocate some kind of congestion toll, both as a means of rationing existing capacity and as a signal for investment, offering in some cases a schedule of charges depending on congestion levels and drawing upon empirical data. No attempt appears to have been made to quantify air pollution and noise costs or to levy charges that would internalize them.

accounting for them would undoubtedly increase user charges by at least a factor of two. While San Francisco may in some ways be a special case, evidence suggests that the results probably are pertinent to other large central cities and many medium-size cities as well.[2]

There is good reason to question continuing the large and long standing subsidy of the private automobile.[3] San Francisco also subsidizes its transit system, and this cost is large and appears to be rising. Reducing the automobile subsidy would not only have the effect of reducing costs for city services, it would also reduce the subsidy required by transit. With the BART regional rail transit system due to begin operation in the Spring of 1972, the consequences of encouraging overuse of the private auto are going to become even more expensive.

Detailed costs estimates are made in the first section. This process is somewhat tedious since the services used by motorists are of a large variety, most City departments are involved in some part, and most of the figures must be obtained indirectly. The reasons for going

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[2] Bruening's testimony [2] indicates results similar to those obtained in our study, but only the total expenditures item is given. His statement is that "...motor vehicles are subsidized per vehicle as much as $70 per year from property taxes..." (p. 83). Bielak and McCarthy, and St. Clair, utilize data from a study of National highway costs in 1960 compiled by the Bureau of Public Roads but unpublished. Both articles note that within cities about two-thirds of the expenditures are covered by user charges, with the remainder coming from general funds including primarily the property tax. Their data, other than being ten years older, differ from those presented here in three respects: (1) No allocated costs are included, which would eliminate most of the entries we present, (2) About 70% of the recorded expenditures are for capital improvements, whereas ours are less than one quarter, (3) Sales tax revenues were classed as general funds, whereas we regarded sales taxes on autos and automotive products as user charges. Thus our analysis is largely independent of the issues of peak-load pricing and of investment, and can be directed at the simple efficiency of charging users for annual operating costs.

[3] Some would not regard the use of the property tax for providing automobile services a form of subsidy. From the standpoint of theory, this practice is not defensible (e.g., Strotz [38]), but downtown merchants are generally willing to subsidize motorists. Presumably the costs are passed on to the general customer.

into this lengthy discussion are threefold: (1) It illustrates the pervasiveness of auto service costs in the public sector of urban communities, which has been largely overlooked;[4] (2) Hopefully it provides a better basis for estimating the magnitudes of the costs; and (3) A basis is established for designing user charges that are appropriate to the specific costs.[5]

In the following section, similar estimates are made for revenues. Because of the relatively smaller number of sources, this task is considerably simpler than estimating costs. Finally, policies are proposed for setting user charges so as to reflect approximately the social costs carried by the City government.

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[4] Functional breakdowns seldom allocate costs not already separated, e.g., the Census Bureau's estimates [39] for San Francisco for 1964-5 listed $4.729 million as non-capital highway costs, out of a budget of $202 million.

[5] The pure distinction between marginal and average costs becomes less clear in practice, but price theory offers adequate guidelines for setting user charges based on costs. See Walters [42], Nelson [13], and Fitch [5].

I. COSTS

A very restricted accounting has been employed, despite the obvious exclusion of important costs, in order to obtain clear and direct results. Only expenditures by the City and County of San Francisco for the purposes of providing services to motor vehicles are counted as costs, and only user charges that accrue to the City are considered revenues. The danger in such an analysis is that the results of a partial accounting may be contrary to those of a comprehensive one. In this case, it is assumed that private costs (other than user charges) approximately equal marginal social costs, that external costs strongly favor the auto driver, and that it is preferable to settle accounts directly rather than indirectly.

This eliminates all private market costs (gasoline base price, insurance, car purchase, servicing), all non-price costs (congestion, air pollution, noise and visual pollution), and exported costs (the ultimate disposal of auto hulks that are abandoned in the City). For convenience some costs are assumed to be netted out, as in exchange services between different police departments for the retrieval of stolen autos.

Types of Costs

The categories of costs listed below are paid by the City for the benefit of automobile users and other highway users. They do not include the purchase and maintenance of autos for use by City agencies, except to the extent that these autos are for the purpose of providing services to

private auto users, e.g., in the case of retrieving a stolen car. Current costs are those incurred in order to maintain service on existing facilities, such as street repair, traffic control, and responding to auto thefts. Capital costs are those used to increase the capacity of traffic facilities, such as street widening, additional parking, or new construction. Some costs are in the nature of increasing the efficiency of utilization of existing facilities, such as new signalization, channelization or parking meter installation, and these fall between the two types. Direct costs are paid as an immediate consequence of the presence of the automobile, such as traffic control, street repair, and court costs of settling auto-related legal conflicts, while indirect costs are those of general overhead for supporting line agencies, such as payroll administration for traffic policemen.

Current Direct Costs:

Street Maintenance -- Resurfacing, painting lines, replacing bulbs in traffic signals, sweeping up debris, and servicing street lighting are examples of right-of-way maintenance costs.

Traffic Control -- This includes (a) signs, signals, actuating devices and other hardware, (b) policemen involved in directing traffic and monitoring traffic flow, and (c) channelization and other traffic engineering services.

Motor Vehicle Code Enforcement -- Parking and moving violations, plus auto theft, burglary, and vandalism, require policemen, meter maids, towing services, powerful patrol cars, judges, lawyers, court facilities, and extensive record keeping and information systems.

Traffic Accidents -- Damage to property, injuries to persons, and their attendant costs are largely private and are carried by the individual

through insurance or directly. Costs to the City include police action and accident reports, delay to transit vehicles, medical expenses carried by the City, and physical damage to City facilities and vehicles. Some accidents may involve claims against the City or between drivers, bringing in court costs, attorney fees, and settlements.

Parking -- Construction of new parking facilities is a capital cost, but servicing meters, administering parking regulations, fees and taxes are current costs.

Driver Education -- Most of the time and effort of learning how to drive is expended by the auto user, but items such as driver education classes in high schools, driver clinics, special classes for police officers, free auto mechanic and servicing courses, and promotional materials regarding changes in regulations, one way streets or other policies are costs borne by the City.

Disposal -- Over 6,000 vehicles per year are abandoned on San Francisco streets, and the costs of designating, removing, and salvaging or junking these vehicles fall upon the City.

Current Indirect Costs:

General Administration -- All the above costs create indirect costs in that a bureaucracy is required to administer the fees, fines, and manpower assignment, design regulations, and evaluate different policies. Even the Board of Supervisors spends some portion of its effort on traffic related problems.

Capital Costs:

New Facilities -- Additional streets, freeways, paving, parking lots, street widening, bridges, and buildings are capital expenditures

that are undertaken by public agencies. New gas stations, service garages, pipelines, storage tanks, parking garages, and auto parts stores are capital investments made by private corporations, and do not generate costs included in this accounting. The important feature of capital expenditures is that they commit the City to an indefinite stream of current expenses in order to maintain the new facility.

Cost Estimates

Fiscal year 1969-70 was chosen as the most recent period for which as good data as exist could be found, but many different sources of data had to be fitted together to generate the accounts. For a wide variety of reasons, each source differs in the accounting procedures used. Sometimes the difference is between calendar year and fiscal year, but usually it is subtler. Because of this, it is necessary to find at least one source that is comprehensive, i.e., all the pieces add up to the total City budget.

In San Francisco, this source is the Controller. Revenues and expenditures of all types are collected into a consistent accounting framework that allows for comparisons between components and between years. On the expenditure side, however, the detail given in the Controller's Annual Report is inadequate, so the actual expenditures given for 1969-70 as part of the 1971-72 Budget were used instead. The difference between these two accounts is that "actual expenditures" includes some expenses that are committed but not paid for, whereas the Controller's statement does not include these.

In comparing revenues to expenditures, then, there is a slight lack of comparability, even though they are for the same fiscal year. To estimate the discrepancy, various subtotals were compared between the

two accounts. While the Budget figures had some overlapping categories, and hence totalled to more than the Controller's report, satisfactory adjustments could be made to achieve consistency.

City reports provide no functional breakdowns other than the most general, so portions of departmental budgets were assigned to auto service costs using indicators derived from annual reports. More than one choice was usually available for this purpose, and the compromise which seemed most reasonable while preserving a safely conservative bias of understating true costs was chosen. Costs thus tend to be proportional, closer to average costs than marginal costs, and do not necessarily predict the magnitude of change in costs for a given change in auto usage. The Fire Department would not reduce its units in service if there were no auto fires. Yet while the marginal cost of putting out auto fires may be zero from the standpoint of the Department, the service is of value to auto drivers (even if they never need to use it) and is reflected in auto insurance rates (they would be higher if the Fire Department did not service autos, just as residential insurance rates are higher where the level of service is lower). The rationale for estimating costs is as a basis for charging, on the assumption that the value of a service is proportional to the amount of it consumed. In many areas of public services the determination of who is the marginal user can never be made, and hence a modified average cost pricing may have to serve as an approximation for charging purposes.

Table 1 shows the results of the estimates. Not all agencies are included, but all those that were considered for a possible private auto service component (in some cases it was decided that they had none) are shown. Direct expenses including current and capital amounted to $ 36.935 million, which is 8.6 percent of the total City budget excluding

TABLE 1: EXPENDITURES FOR THE CITY AND COUNTY OF SAN FRANCISCO, 1969-70

(millions of dollars)

	Actual Expenditures	Auto Service Expenditures		
		Current	Capital	Total
Police	28.951	13.027		
Public Works	16.351	3.825		
Special Gas Tax Fund	3.905	.121	3.784	
Road Fund	8.888	5.293	3.595	
Public Works Capital Imp.	.081			
Sheriff	3.112	.155		
Recreation and Parks	13.259	.050		
Schools	108.464	.500		
City Planning	.812	.040	.040	
Parking Authority	.040	.040		
Off Street Parking	.160		.160	7.579*
Bond Interest & Redemption	16.961		1.767	
Electricity	1.605	.320		
Public Health	33.562	.200		
Coroner	.399			
City Attorney	1.449	.289		
District Attorney	1.121	.112		
Municipal Court	2.523	.757		
Superior Court	1.530	.070		
Juvenile Court	4.589	1.000		
Public Defender	.512	.050		
Social Services	105.824	.200		
Fire Department	24.594	.300		
Municipal Railway	19.209	1.240		
Other	30.291			
Total Direct	428.192	27.589	9.346	36.935 (8.6%)
Civil Service Commission	1.010			
Controller	14.269			
Mayor	.793			
Board of Supervisors	.715			
Chief Administrative Officer	.206			
Treasurer	.249			
Tax Collector	1.172			
County Clerk	.740			
Director of Finance & Records	.280			
Purchasing	1.271			
Real Estate	.947			
Retirement	42.523			
Total Overhead	64.175	5.519		
Total	492.367	33.108	9.346	42.454

*Current investment

purely overhead functions. These last expenses are then allocated in the same proportion, yielding an additional $5.519 million. Total auto-related service costs to the City are thus $42.454 million.

1. The Police Department

A great deal of the Police Department's total effort is involved with the automobile; roughly 45% of the departmental budget is absorbed in providing auto-related services. Some of these are directing traffic, arresting drunk drivers, administering breath tests, training and equipment in the administration of such tests, issuing citations for illegally parked vehicles, enforcing the motor vehicle code, receiving reports of stolen vehicles, apprehending persons responsible and recovering stolen vehicles, reporting auto accidents, investigating hit-and-run accidents, administering first aid and providing emergency ambulance service for auto accident victims, holding classes in accident prevention, reporting and investigating auto burglary, designating autos for towing which have been abandoned, providing traffic information, participating in the regional, state and national computer information systems which check on stolen autos, appearing in court to testify in auto-related arrests or other legal conflicts, and providing information to other city agencies useful for maintenance and repair of street lighting, traffic signalization, etc.

During 1970, 14,193 autos were reported stolen in San Francisco. The estimated value of these autos was $9.2 million, which was 41% of the total value of property reported stolen. One thousand three hundred and seventy-three persons were arrested or detained for auto theft, about 14% of the crimes against persons or property. Drunk driving, drunk in auto, and traffic violations accounted for an additional 8,098 arrests of the total of 60,268 (this includes 17,831 arrests for drunkenness,

and 7,380 for disorderly conduct). Juvenile arrests and citations totalled 15,989, of which 4,288 were for auto theft or traffic violations (parking citations are not included in any of the above figures). In addition to the value of stolen autos was the value of auto accessories stolen ($.2 million) and goods stolen from autos ($2.1 million), highway robberies ($.3 million) and oil station robberies ($7 thousand). There were 21,755 auto accidents in the City investigated by the Department causing 4,921 injuries and 93 deaths. On the basis of rough indicators, then, activities involving citizen-owned automobiles occupied a substantial portion of the Department's attention.

Estimates given in the tables below of the proportions of primary function units spent on auto-related activities are based on general information about the purpose of the unit, judgment, and some statistics. The vast majority of warrants issued are for traffic violations, making Central Warrants predominantly auto services. Inspector's bureau contains auto and burglary units, plus the crime lab. The only estimate that would make much difference if it were to vary greatly would be that for Uniform Patrol, and it is set at a low 20 percent. General overhead units are assumed to provide support in approximately the way personnel are distributed in the primary units. In addition, the distribution of pay scales is assumed to be roughly the same for each unit. Since salaries amount to around 90 percent of the departmental budget, the total budget is allocated according to personnel, yielding the $13,027,000 estimate of the amount spent by the Police Department for auto-related services. Details are given in Table 2.

TABLE 2

ALLOCATION OF POLICE DEPARTMENT COSTS

Unit	Strength*	% Auto-Related	Allocation
Chief	64	20**	12
Police Range	5	0	0
City Prison	57	0	0
Stables	5	0	0
Central Warrants	52	60	31
Narcotics	29	0	0
Inspectors	197	20	39
Juvenile	58	30	17
Traffic	653	100	653
Uniform Patrol	953	20	191
Intelligence	28	0	0
Total	2101	45%	942

* Sworn plus civilian personnel as of December 31, 1970.

** While the chief and his deputy should be assigned to general overhead, the chief's office is included within Headquarters Company, which made 800 arrests in 1970, of which 175 were for auto theft. The only units within HQ with sufficient patrolmen to achieve this are the city prison, communications, and the chief's office.

GENERAL OVERHEAD

General Office	9		
Property Clerk	9		
Accounting	3		
Garage	2		
Communications	77		
Record Room	43		
Statistical	8		
Identification	51		
Crime Prevention	93		
Personnel	72		
Academy	92		
Total	459	45	206
Total	2560	45	1148
Budget	$ 28.951		$ 13.027 million

2. The Department of Public Works

A wide variety of activities within the Department of Public Works are solely or partially directed at providing services to automobile users. The Department maintains the streets through repaving and cleaning, paints lines and markings on streets, constructs and maintains traffic signs, officially records and maps streets, makes street improvements as the City's contribution to Federal matching programs, issues permits for curb cuts and other street modifications, counts traffic volumes and performs engineering studies, improves traffic flow through channelization, installs and maintains street structures such as guard rails and lamp posts, installs and maintains street lighting and plantings, operates and maintains bridges within the City, provides architectural and inspection services to other City departments, and repairs damages to public buildings.

Besides the General Fund, the Department has two major sources of revenues that are earmarked for specific purposes. One is the Special Gas Tax Street Improvement Fund, and the other is the Road Fund, and both are supported by user charges collected by the State and shared or returned to the City. A small proportion of the Department's work is covered by direct charges to private individuals or firms. Table 3 shows the breakdowns.

3. Sheriff

The County of San Francisco maintains a Sheriff in addition to the City Police Department, but the activities of the Sheriff include no patrols of any kind. Several of the Department's functions support services to auto users indirectly through the courts and jails, and the others are unrelated. On this basis, a share of five percent was assigned

TABLE 3: COST ALLOCATION FOR THE DEPARTMENT OF PUBLIC WORKS

	DPW[1]	SF Bud[2]	Auto Current	Auto Capital	
	(millions of dollars)				
Current Direct Expenditures					
Architecture	.137	.138			
Building Inspection	1.704	1.712	.300		
Building Repair	3.846	4.180	.385		
Traffic Painting	.304		.304		
Central Permit	.096	.096			
Engineering	.992	1.026	.100		
Water Pollution Control	3.842	3.942			
Street Cleaning	3.677	3.677	1.838		
	14.598	14.771	2.927		
Special Gas Tax Street Improvement Fund					
General Maintenance	.004	1.635			
Construction	.104	1.887			
1.04% Matching Funds	.013	.383			
	.121	3.905	.121	3.784	
Road Fund					
Street Reapir	2.966	2.951			
Select System Construction	0	.279			
Traffic Engineering	1.218	1.226			
General Maintenance	.625	2.713			
Construction	.078	1.313			
Street Planting	.406	.406			
	5.293	8.888	5.293	3.595	
Capital Improvements	.099	.081			
Total Direct		27.645	8.341	7.379	15.720 (57%)
Current Overhead					
General Office	.636	1.323			
Accounts	.167	.167			
Personnel	.091	.090			
	.894	1.580	.898		
TOTAL	21.009	29.144	9.239	7.379	16.618

[1] Items from the Departmental budget as reported in the Annual Report 1969-1970 (City and County of San Francisco, Department of Public Works, June 30, 1970).

[2] Items in the "City and County of San Francisco Budget Fiscal Year 1971-72" (San Francisco Examiner, Saturday April 17, 1971).

to autos, somewhat less than the overhead rate for the City as a whole.

4. Recreation and Parks

Free parking is provided in many areas of the City's parks, and in part, streets and lots in the parks are maintained by the Recreation Department. The Maintenance Division of the Department has a budget of $.3 million, and contains a Road Maintenance Division as one of several components; $50,000 was assigned to auto services.

5. Schools

Costs to the Board of Education include driver training classes, vocational courses in auto repair, and provision of parking for students at school buildings. The student is not charged for these services, except for materials in some cases. The State of California contributes $.4 million for driver education programs, and, lacking more detailed information, auto-related costs to the school board are assumed to exceed this figure by some small amount.

6. City Planning Department

This department undertakes the review and investigation of transportation proposals and projects, prepares long range plans for transportation and other urban functions, and develops the Capital Improvement Program for the City. Roughly ten percent of the Department's activity might be related to automobile planning considerations.

7. Parking Authority

Off-street parking lots and garages are under the general control of the Parking Authority, but design, construction, management, and

maintenance are usually turned over to a private contractor. The contractor bids on a particular project, and includes debt service and a management fee in the bid price. Any revenues he receives above the costs specified in the bid are turned over to the City and go into the Off-Street Parking fund, along with half of the revenues from parking meters in the City. If the operating revenues from a garage are insufficient to pay the full costs, then the difference is made up from the Parking Fund or from general revenues. Firms operating the garages pay City property taxes but are exempted from income taxes as non-profit corporations. Parking garages constructed under parks are returned to the Recreation and Parks Department for administration after the revenue bonds have been retired.

Because of the largely independent arrangements by which off-street parking is contracted for, it is difficult to obtain a net balance on parking operations. The item listed in the city budget for off-street parking is taken as this balance.

8. Capital Improvements

Expenditures for capital improvements are incorporated into the budgets of the agencies that administer the expenditure, primarily Public Works in this case. Revenue bonds are paid off out of receipts earmarked for the purpose, so only general obligation bonds create a cost that appears in the City budget. Interest and redemption charges for 1969-70 are:

	Total	Auto
1947 Street Improvement	.515	.515
1947 Off Street Parking	.336	.336
1964 Street Lighting	.233	.116
		$ .967 million

Adding an overhead charge of 8% of the remaining bond costs that are for general government increases the auto-related cost by $.8 million, to $1.767 million.

9. Electricity

The major responsibilities of the Department of Electricity are the maintenance of the Fire, Police, and other communications systems in City agencies, maintenance of traffic signals, installation and maintenance of parking meters, and maintenance of the Central Fire Alarm Station. Nine hundred and eighty-five meters were added during the fiscal year, bringing the total to 14,221 in the City. Auto service costs were estimated to be at least 20% of departmental expenditures.

10. Public Health

The Department of Public Health operates a large number of highly varied facilities, of which some treat victims of auto accidents. Two percent of the deaths in San Francisco are from auto accidents; if this proportion holds roughly for overall workload, and 30 percent are indigent or at City expense, then about .60 percent of the Department's budget goes for services to auto users.

11. Attorneys and Courts

The City's legal system includes the City Attorney, the District Attorney, the Public Defender, and the Municipal, Superior, and Juvenile Courts. While the annual budgets of these agencies are individually not particularly large, together they accounted for $11.724 million of the 1969-70 City budget. The most reasonable approach for estimating auto-related expenses is to analyze case loads, for which limited but perhaps adequate information is available.

The City Attorney's office handles torts and similar kinds of civil actions involving property and personal injury liability judgments. A major source of these seems to be the public transit agency, and presumably many of these result from auto accidents. The agency pays for some of these services, but how close this comes to covering full costs is difficult to determine. A rough but conservative estimate would be that 10 percent of the Office's activities are the consequence of automobiles.

The District Attorney has responsibility for a broad range of legal services that are primarily concerned with criminal actions. Contained in the Office are three divisions, two bureaus, one section, and the Grand Jury. The Complaint Division is the one must directly involved with auto cases. Of the 18,145 "No Warrant" felony arrests, 1,593 were driving offenses or auto theft; out of 8,748 felony cases taken to Municipal Court, 883 were auto theft or violations; approximately 20 percent of the jury trials related to vehicular violations and theft; 16,780 of the total 39,009 misdemeanors were auto-related. While the relative sizes of the different subunits of the Office can only be guessed at, auto cases appear to occupy about 15 percent of the total workload.

Municipal Court contains four general departments and two special departments that handle only vehicle code and traffic cases. The two special departments appear to carry about 40 percent of the cases, but these may be more routine than non-auto cases. Nonetheless, the special departments are relatively large, and probably absorb at least 30 percent of the Court's budget.

Superior Court has jurisdiction over felony cases in San Francisco, and it is likely that a relatively small proportion of the various kinds of vehicle code violations, auto theft, or other litigations

(including accident liability determination) arising from automobile usage are heard in this court. Perhaps five percent of the Court's budget is taken by such cases.

Juvenile Court is primarily a referral and rehabilitation agency as opposed to a Court of law, but auto-related offenses figure prominently. Of 14,873 total referrals, 4,450 were from traffic cases; of 1,640 offenses by delinquent boys, 527 were auto theft and 21 resulted from traffic violations. Assuming rehabilitation costs follow this pattern, about 25 percent of the Court's effort involves delinquency arising from auto violations. It may be true that many of these youthful offenders would have found something else illegal to do if there were no autos to steal, but it is also true that auto theft is largely a function of opportunity.

No information about the caseload of the Public Defender was obtained, but five percent of his budget is not likely to overstate the auto-related share.

12. Social Services

Accounting for the expenditures of the Department of Social Services presents some thorny conceptual problems because of the large size of these expenditures and the tenuous relationship to auto-related services. Treating social services as general overhead would result in the addition of about fifteen million dollars to the debit side, a figure too large to treat so casually. One alternative would be to keep overhead separate throughout the accounting and let the case rest primarily on direct expenses. There is no reason for excluding any of the other overhead expenses, however, since they have a clear function in the provision of municipal services. Social service expenditures, on the other hand, are simply an added burden.

An important reason for not treating social services as overhead is that most of these expenditures are for the purposes of providing income to persons who otherwise would not have any income or as much income (because they are aged, disabled, blind, unemployable, orphaned, etc.), and hence serve to redistribute income. At issue in tabulating auto costs and revenues is the question of simple economic efficiency -- you should pay for what you get -- and not equity. In theory, redistribution is best handled by the Federal government through the income tax and various social programs, with lower units of government being essentially neutral. In practice, central cities are saddled with an almost overwhelming share of the costs of income redistribution. Thus public assistance programs exist, and cannot be ignored.

Subtracting social services from the accounts altogether would be admitting defeat. A compromise was to reduce the importance of social service expenditures to almost nothing by estimating only the most direct impacts of the auto system on welfare costs. The 166 traffic fatalities that occurred during the year resulted in an expected lifetime income loss of roughly $50,000 each, or a total of about $7 million.* In at least some of these cases, loss of this means of support meant that dependents of the victim went on public assistance. In addition, the almost 5,000 personal injuries sustained in auto accidents must have created some new welfare recipients. Whatever the true figure is, $200,000 cannot be considered an overestimate.

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*The Public Health Department reports 166 deaths from auto accidents, including pedestrians, for 1969; the Police Department reports 93 traffic deaths for 1970. The former figure appears to apply to the calendar year while the latter to the fiscal year, hence they overlap. Whether the difference is due solely to reporting period or also to definitions (reporting, pedestrians, location, etc.) has not been determined.

13. The Fire Department

Automobiles create a cost for the Fire Department in two ways: accidents between fire trucks and private autos, and fires in autos or accidents between private autos and hydrants and fire boxes. Department units were involved in 145 vehicular accidents in 1969-70, resulting in 150 "Lost Work Days." Presumably some settlements were also required. Some 33,619 alarms were responded to, of which 13,355 were false alarms. Auto alarms amounted to 1,587 in the categories given below:

backfire through carburetor	476
collision with fire alarm box	11
collision with fire hydrant	181
motor igniting	138
overheating brakes	26
overheating transmission	29
seats and upholstery	409
wiring	317

Other alarms included 60 for street road flares and 1,387 for street washdowns. Very few of these calls ever result in either serious personal injury or heavy property damage, and they do not interfere appreciably in the Department's other activities.

In addition to the above, the Fire Department also inspects a number of business establishments as part of its fire prevention program. This service can be regarded as a service to property and hence covered by the property tax, except that only certain activities require permits and inspections are heavily concentrated in certain uses. Many of these are auto-related because of both the petroleum products that are often present in large quantities and the large number of such establishments. Over 700 permits or inspections of this type were made.

Costs were estimated using the following guesses:

1500 alarms @ $150	225,000
145 accidents @ $100	14,500
700 permits-insp. @ $50	35,000
150 days lost @ $50	7,500
washdowns, other	18,000
	c. $ 300,000

14. Public Transit (The Municipal Railway)

By far the greatest cost to Muni created by automobiles is the decline in service resulting from auto congestion, with attendant declines in patronage which becomes self reinforcing. Currently available information does not allow for a satisfactory estimate of the amount of this cost, and so it will have to be ignored. A more direct cost is from auto accidents with Muni vehicles, and passenger injuries which may result from collisions. Costs for the 4,428 traffic accidents and 1,785 passenger accidents are given below.

Personal injury	$ 1.0 million
Property damage	.2
Salaries and wages	.7
Miscellaneous litigation expenses	.17
Insurance	.01
	$ 2.07 million

Assuming sixty percent of this cost to be auto-related, autos cost Muni $1.24 million in accident expenses.

II. REVENUES

Any municipal income derived from an auto-related source or which is earmarked for automobile services is considered here to be a user charge. Under these criteria, it is possible for an intergovernmental transfer to be earmarked for an automobile service but not derived from an auto-related source, but the number of such cases is negligible.

Types of Revenues

Municipal revenues come from a wide variety of sources. Some are direct user charges (such as a bridge toll) and some are unearmarked general ability-to-pay revenues (such as an income tax). The vast majority, however, are some combination, in that they do not fall equally on all segments of the population and they are not neutral with respect to different patterns of consumption.

Property Tax

The taxation of primarily real (although some personal) property is the major source of general revenues for most cities. In San Francisco, it is the tax that is used to balance the budget, i.e., whatever deficits are left over after all other expenditures and revenues have been accounted for are paid by a tax on property. In another sense, the tax on property is a user charge for services rendered to property or property owners.

Sales Tax

In San Francisco, most items other than food are taxed on their sale value, with tax receipts going to the State of California, the City,

and the Bay Area Rapid Transit District. Gasoline is exempt from the local sales tax because of the special state tax imposed on it, but tires, batteries, auto accessories, and autos themselves are taxed by the City at a rate of 1¢ on the dollar.* The State does the collection and returns the revenues to the City after charging a fee for the collection service.

Fees, Licenses and User Charges

Vehicle registration fees and drivers licensing are handled by the state, with some portion of these receipts shared with the City. The only local automobile use charges are for parking and towing.

Intergovernmental Transfers

The State of California returns to San Francisco a portion of the monies it collects in gasoline taxes, license fees, and registration fees. The State also contributes a small share for driver training costs.

Fines

In enforcing the motor vehicle code in the City, fines may be levied against violators and the receipts used to offset costs of providing the services.

Other Revenues

San Francisco levies a business tax, which falls partially on private auto user services. Other revenues may come from departmental revenues, interest earned and miscellaneous sources such as parking meters.

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*Beginning in June of 1972, an additional tax will be placed on gasoline at the sales tax rate, and earmarked for public transportation purposes.

Revenue Estimates

Table 4 summarizes the estimates of revenues from auto-related sources. The first six items are locally derived, with the remainder received from the State of California as grants or shared taxes. Omitted from the list are Federal gasoline and excise taxes, since they are not returned to the City of San Francisco.

1. Retail Purchase and Use Tax

Taxable transactions in calendar year 1970 by auto dealers, auto supply stores, and service stations amounted to $156.193 million; taxed at a rate of 1¢, this would yield revenues of $1.562 million, less a fee paid to the State for collection. Total taxable transactions were $2,258.878 million, of which the auto share was 6.9%. Fiscal year 1969-70 produced $23.830 million in revenues from the sales tax, and applying the auto pro-rated share leads to a sum of $1.644 million in sales taxes from auto-related sources.

2. Business Tax

The business tax is based on a combination of gross receipts and total payroll expense, and applies to business firms and self-employed persons operating in San Francisco. A great deal more than just retail businesses are subject to the tax, giving it a much broader base. Some of the auto-related enterprises that would be covered by the business tax but not the sales tax are gasoline service stations, automobile repair garages and body shops, and auto rental agencies. Assuming that the incidence of this tax is the same as the sales tax, the same proportion of 6.9% was applied to the total receipts from the business tax of $7.977 million, yielding $.550 million in auto-generated revenues.

TABLE 4: REVENUES FOR THE CITY AND COUNTY OF SAN FRANCISCO, 1969-70

(millions of dollars)

	Actual Receipts	Auto Generated Revenues		
		Current	Capital	Total
Retail Purchase and Use Tax	23.830	1.644		
Business Tax	7.977	.550		
Court Fines	5.555	4.266		
Departmental Revenues	46.645	.857		
Interest Earned	12.133	1.994		
Other Taxes & Licenses, Misc.	3.180	1.593		
Total City	352.889	10.904		10.904
Motor Vehicle Licenses Fees	9.218	9.218		
Driver Training Program	.369	.369		
Special Gas Tax Fund	5.550		5.550	
Special Road Improvement Fund	3.668		3.668	
Total State	152.955	9.587	9.218	
Total City plus State	505.844	20.491		29.709

3. Other Taxes and Licenses, Including Miscellaneous

Remaining revenue receipts that can be regarded as auto-generated or user charges for auto-related services are parking charges ($1.320), street and curb permits ($.231), and business vehicle licenses ($.042). Accepting these in their entirety, they produce $1.593 million in revenues.

4. Court Fines

Vehicle Code Fines are reported by the City as $4.267 million.

5. Departmental Revenues

Many services provided by the City can be charged for directly in some form or other, and often this is done. The basis for the charge is usually direct marginal costs, and hence seldom covers very much of the total cost.

	Revenues 1969-70	Auto Share
Special Police Services	.070	
Special Fire Services	.011	
Engineering Fees, Inspections	.035	
Municipal Court Fees	.409	.200
Superior Court Fees	.670	.400
Sheriff's Fees	.223	
Other General Govt. Services	.158	.100
Maintenance of Highways	.041	.041
Misc. Highway Service Charges	.116	.116
Total		.857 million

The above figures in column two are estimates.

6. Interest Earned

The City of San Francisco possesses almost one billion dollars in negotiable assets, of which approximately $285 million is in some form of cash and about $265 million is deposited in banks and drawing interest.

This last figure excludes assets of the public service enterprises such as the Municipal Railway. Total interest earned amounted to $13.807 million of which $12.160 came from the General Fund, the Gas Tax Fund, and the Road Fund. The assets of these funds are distributed in the following way:

	Total Assets	Auto Generated
General Fund	101.285	1.521
Gas Tax Fund	28.202	28.202
Road Fund	13.783	13.783
Other	122.097	0
Total	$ 265.367	$ 43.506 million

The auto generated portion is thus 16.4%, which implies interest earned by these assets is $1.994 million. Determination of the auto portion of the general fund was based on the factors below:

	Share of General Fund	Auto Share	Combination
sales + business tax	.0629	.069	.00434
court fines	.011	.8	.00880
departmental revenues	.0922	.02	.00188
			.01502

Applying this proportion to general fund revenues gives $1.521 million in auto-generated revenues earning interest.

7. Motor Vehicle License Fees, and the Driver Training Program

For each vehicle registered in the City of San Francisco, the State returns a certain amount from the annual registration fee to the City. Currently, the amount returned is $11 per private automobile and more for other kinds of vehicles. The State also levies a vehicle use tax which operates as a sales tax for vehicles purchased outside the

State, and some of these receipts are probably returned to the City. State funds are also earmarked for driver training, but the source of these funds is not known; most likely they are from the registration fee.

8. Special Gas Tax and Road Improvement Funds

California levies a tax on gasoline of seven cents per gallon, of which a portion is shared with cities and counties according to a complicated series of formulas. Seventy-five percent of the receipts from a tax of 1.625 cents per gallon is apportioned to counties on the basis of the number of registered vehicles. Cities over 500,000 get $1,667 per month, (others get less) and any county with snow removal costs gets these paid by the State. Remaining receipts from this portion of the tax are distributed according to county road mileage or registered vehicles. Another 1.04 cents per gallon is apportioned to counties on the basis of registered vehicles. If there are cities within but not coterminus with counties, the county share is divided on the basis of assessed valuation and population. Another .725 cents per gallon is apportioned to cities on the basis of population. Twenty percent of the local receipts from the 1.625 portion of the fund and 40% of those from the .725 portion must be used for capital improvements of local streets that primarily serve state highways.

Less than half the State gas tax is shared, and the remainder presumably goes for State highway needs. Despite a few adjustments to favor large cities, the formula appears to be biased towards rural and suburban counties. The portions of the tax formula that are graduated according to size give out relatively small sums, and the major revenues are divided according to vehicle registration and population. A city such as San Francisco is likely to have a large share of its traffic

generated by autos registered elsewhere, and the costs of traffic control and street maintenance are probably increasing functions of population density.

III. POLICIES FOR IMPROVING PRICING

Using the Estimates above, the total deficit amounts to $12,745,000. It is difficult to draw a hard line between current and capital costs, but a reasonable guess from Table 1 would be $7.579 million for new capital, which disregards payments for capital already in place at the beginning of the fiscal year. On the assumption that new capital costs are covered by the gas tax revenues from the State, current expenses run at the level of $34.875 million. The deficit is thus almost 60% of current revenues ($22.130 million), a very large subsidy. The City must make up this deficit from other revenue sources, primarily the property tax, resulting in the general taxpayer supporting a substantial portion of the automobile transportation system. Low income renters, for example, are paying for services to auto users when they themselves may not even be able to afford an auto. The effect of such a subsidy on auto users is not only unfair on both a benefits-received or ability-to-pay basis, it is inefficient in that it encourages auto usage at a time when the negative external effects of automobiles are becoming especially onerous.

One observation should be made about capital investment. Even though the costs of capital improvements seem to be covered by earmarked State revenue sources, they still increase the deficit since they increase the level of current expenditures required to support the system. Any increase in the capacity of San Francisco streets to carry traffic increases costs to the City more than it increases revenues. Until user

charges are raised to the point that they cover current costs, capital improvements will only worsen the deficit.

No explicit mention has been made of trucks in the analysis. There were 48,315 trucks and commercial vehicles registered in the City in 1969 and presumably they received the benefits of street maintenance and traffic control as well as private autos. Trucks also pay registration fees and gasoline taxes. On the other hand, trucks may be distinguished from autos because trucks require a more costly road, trucks tend to avoid peak hours, or they differ in other characteristics. While trucks should be subject to the same set of user charges (not necessarily at the same levels), they may respond to them differently. For example, a congestion toll might reduce auto traffic and thereby increase truck traffic during peak periods because the toll would be more than offset by savings in drivers' times. Thus trucks have been lumped with automobiles in the results given here, but policy should acknowledge that the two are not homogeneous.

To recover the deficit, user charges should be based on benefits received, in this case the cost of providing the particular service being used. This principle can be only approximated in practice, since the nearly continuous charging required would be extremely costly, and the exact amount of such charges hard to specify. In addition, the user should be aware of the charges, as he is in making telephone calls.

Many problems arise in equating a balanced budget with economic efficiency. If average costs are decreasing, pricing based on marginal costs will not cover total costs. This effect is caused by large fixed costs, which are almost totally absent from our figures. The deficit is in operating costs, i.e., the marginal costs of continuing the system

for one more year. Another argument says that costs and revenues need not balance in the short run, particularly if investment is not optimal. If this be the case, the conclusion should be to raise auto charges gradually and in conjunction with other transportation policies, allowing individuals and firms time to respond. A third reason for pricing at other than cost would be the desire to regulate demand for purposes other than simple efficiency. Such rationale (e.g., equity) suggest that the auto should be overcharged rather than subsidized (San Francisco has a stated policy of opposing freeway construction). Since virtually all transportation is subsidized, some might urge retention of auto subsidies as a second best solution; we feel this justifies transit subsidies but not the other way around. The list could be extended.

1. Costs that depend upon the amount driven

The shortest-term decision made by an auto driver is whether to go another mile or leave his car and go some other way. To the extent that he uses his car, he requires traffic control, street maintenance, and increases the risk of accident or vehicle code violation. A tax based on mileage would be the proper one, and since gasoline consumed depends heavily on mileage, the gas tax is a workable mechanism. A 5¢ increase in the gasoline tax would produce additional revenues from San Francisco drivers of about $2.7 million (assuming 400,000* cars driven 2,000 miles per year in the City and getting 15 miles per gallon gasoline). One problem with the gas tax is that if it were applied only in the City, there would be an incentive to try to escape the tax (by buying gas outside the City), and if it were levied statewide,

*This figure includes 290,831 cars registered in San Francisco in 1969 plus more than 100,000 cars belonging to commuters and other non-City residents.

San Francisco drivers might be shifting some of the burden onto rural residents. There is little doubt, however, that the gas tax should be increased by some amount.

2. Costs that depend upon the presence of an automobile

Even at rest, the automobile takes up space, and that space could be used for something else if the auto were not there. Traffic signals and many other kinds of hardware must be in place and operating whether there are cars on the road at a particular moment or not. An increase in the total number of cars in the City means that more space must be given over to them and more provisions made in case they wish to move. Costs of this type -- which are variable in the long run but fixed in the short run -- are best covered by an annual fee. Again, San Francisco receives back part of the annual registration fee, but nowhere enough to pay the full costs of "keeping" its resident population of cars. Graduating the fee by weight or value spreads the burden more equitably. A $10 per car increase would produce about $3 million from San Francisco car owners.

3. Costs that depend upon the existence of automobiles

Driver training, disposal of tire carcasses and auto hulks, and some overhead costs such as the preparation of and training in the Motor Vehicle Code are relatively fixed costs which could, in principle, be paid for in a lump sum. Ideally, these costs should be borne at the State or National level, and paid for by an excise tax on manufacturers or a sales tax at the time of purchase. An argument might be made that the person who abandons an auto ought to pay for disposal costs, but he is usually the least able to pay and just happens to be at the end of the line.

Driver training can be paid directly to the instructors or added to the license fee. For the City, the best way to cover these costs is through sales taxes and registration fees.

4. Costs that vary with individuals

Vandals, thieves, burglars, speeders, reckless drivers and parking violators create costs which auto users as a whole must pay for. To the extent that fines will act as a deterrent to various anti-social acts, they should be used, but it cannot be expected that these will cover costs. In reality, it is the average driver who is being protected by the laws and their enforcement and hence should be the one to pay for the service. Thus the deficit of City-incurred crime and accident costs over revenues from fines should be paid by general user charges, preferably through a gas tax or annual fee.

5. Costs resulting from insufficient capacity

Congestion creates numerous costs such as driver and passenger delay, increased concentration of air pollution, loss of pedestrian and residential amenity, and increased engine wear and driver fatigue. Most of these costs are transfers between individuals, and do not result in an expenditure by the City (the major exception is Muni, which loses passengers because it gets caught in the auto-caused traffic jams). Nonetheless, the City possesses, in its street system, a resource which it should utilize as fully as possible.

Implementing peak-load pricing would require hardware and systems development that is well within our present capabilities and would cost

less than currently planned exhaust emission controls.* A major benefit to congestion pricing, besides a more efficient use of existing facilities, is that it conveys the correct information to public authorities about when to build a new facility. Revenues could also be used to improve other components of the transportation system, since all travelers benefit. Short of a full congestion pricing system, the simplest mechanism so far proposed seems to be a parking tax which is graduated by time of day.** Cars parking up to nine or ten in the morning pay the highest tax, with steep reductions thereafter. For a central city, this plan has the advantage of catching the in-commuters who do not otherwise contribute much to city revenues.

6. Costs not accounted for

Air pollution is a cost that is borne by everyone who breathes, but is much worse in densely populated or congested areas. Even when it is the same individual that is doing both the polluting and the breathing, there is no incentive to stop the polluting, since if only one stops driving, the pollution will be unaffected but non-driver will be immobile. Gas tax or congestion toll revenues should clearly be used for air pollution control, research, and development. Another cost which is passed on without compensation is the decrease in residential amenity resulting from noise and fumes from autos. Streets become more dangerous and homes less inhabitable as traffic volumes increase.

Whenever the government invests in a new highway, some persons benefit more than others. Property owners who can take advantage of an

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*The British have developed a system and are currently conducting pilot studies with it. The device which is mounted in the car and records tolls is estimated to cost about $15.

**See Burns [4].

increase in accessibility (e.g., by selling to a gasoline company) enjoy a windfall increase in the value of their properties. Conventional property taxes do not recapture this unearned increment, which thus constitutes another kind of loss to the city.

IV. SUMMARY AND CONCLUSIONS

From a scrutiny of readily available budgetary data pertaining to the City of San Francisco, it is clear that auto users enjoy a substantial subsidy in the form of essential auto-related services provided by the City. Of the total operating costs of almost $35 million, almost $13 million or about 37% are covered by non-auto-related general funds. Since City accounting procedures do not indicate the purposes for which funds are spent, the actual amount of the subsidy is subject to estimation error; its existence, however, is indisputable. Elimination of the subsidy can be handled by a battery of instruments, aimed at car and accessory sales, annual registration, parking, and gasoline sales. The best strategy depends upon what arrangements can be made with other units of government.

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