

# Prospects for Differential Transit Pricing in the United States

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## ABSTRACT

For several decades, planners and economists have been urging public transportation agencies to adopt fares that vary by either the cost of providing service or by the value or benefit of the service to the user. It has been argued that differentiated fares would be both more efficient and more equitable than the more common practice of having a uniform fare level for all services at all times. Although many transit agencies have some form of fare differentiation, few have adopted a fare differential that is near the variety or extent of those that have been recommended. This research was designed to better understand the reasons for adoption or nonadoption of fare differentials, and the factors that might lead to changes in the future. A self-completion questionnaire on transit fare attitudes and opinions was completed by 165 transit professionals representing 63 U.S. transit systems (including all 44 of the largest systems). Respondents overwhelmingly expressed support for a wide range of fare differentials. However, they balanced this support with pragmatic concerns about the adequacy of their analytical tools to provide the necessary policy guidance, the marketability of more complex structures, and the ability of their fare collection systems to adapt to such structures. Prospects for increased application of differential transit pricing will depend on the following: (a) making certain that differentiated fares are appropriate to the local setting; (b) improving analytical tools to accommodate a range of fare differentiation options while providing timely, policy-relevant, and conclusive findings; and (c) improving the technology of fare collection equipment to adapt to more complex fare structures without creating operational problems. All three areas are amenable to continued research and development.

For several decades, planners and economists have been urging American transit agencies to adopt more finely differentiated pricing policies that would set fares for different types of trips or travelers depending on the cost of providing services, the value or benefit to users, or the patrons' relative ability to pay. Regardless of the specific rationale used, fare differentiation has been incorporated into the standard advice on how to improve revenue generation and operating efficiency while maintaining service to the public (1-5). Proponents have argued that fares based on such principles would be more efficient, more equitable, or both.

More recently, the federal government has joined the chorus with an active promotion of fare differentiation, including

- Sponsoring demonstration projects in pricing variations (6);
- Soliciting proposals for innovative pricing projects (7);
- Sponsoring two national conferences on transit pricing (1979 and 1981), and a national televised conference in eight cities (1983) (8,9); and
- Beginning a Resource Center on Transit Pricing to provide technical assistance to local agencies on all aspects of transit fare (10).

Despite this consistent stream of advice, relatively few U.S. transit agencies have adopted even one type of fare differential. Innovative transit

pricing policies appear to be bold and infrequent exceptions to the rule. This research tried to isolate some of the reasons for the apparent failure of expert advice to penetrate actual local policy making.

## RESEARCH APPROACH

### Framework

There are many possible explanations for the relative non-use of fare differentials. Two general areas were proposed for investigation:

- Organizational environment: Are there institutional or political settings in which fare differentials might not be proposed, or in which this might not work?
- Individual characteristics: Are professionals in the transit industry personally disposed to promote or oppose fare differentiation? Is the standard advice known and understood by those expected to act on it?

Addressing these questions first requires an understanding of the fare policy-making process. It turns out that relatively little work has been directed specifically at describing how transit fare policy decisions are made. One gap in previous research appears to have been the lack of systematic, quantifiable, national data on the transit fare policy process. To help close that gap, a self-completion questionnaire was designed for mailing to

transit professionals involved in setting fares. Although others are involved in the process (policy board members, agency operating personnel, riders, and news media, among others), transit professionals must be considered the day-to-day experts at describing their fare policies.

#### Survey Design and Sample

The survey, conducted in 1983-1984, solicited ideas on fare policy from a large national cross section of transit professionals. The sample included all 44 of the largest U.S. transit systems (those with 250 vehicles or more, according to the 1981 federal statistical compilation, the most current at the time of the sample selection), and 19 other systems that either had time-of-day pricing or had indicated an interest in pricing by their attendance at the 1983 teleconference on Transit Fare Policy and Pricing. The 1981 federal statistics indicated that these agencies accounted for about 75 percent of all U.S. transit vehicles and vehicle-miles of service and about 85 percent of transit passenger trips and passenger-miles.

Agency general managers and their immediate assistants were always included; other staff (typically division or department heads) were included from all functions relevant for fare policy (administration, finance, planning, public information, and operations) in which individuals responsible for these functions could be specifically identified. All 63 agencies targeted responded with one or more usable questionnaires, and 67 percent of all questionnaires were returned in usable form. One respondent from each agency was identified as the key respondent for certain analyses. These 63 individuals were selected based on their seniority, rank, and influence in their agencies (as reported in the questionnaire), and by the completeness of their responses. The key respondents were relied on to describe their perceptions of the political and institutional environment and the fare policy process in their agencies (see the section on Organizational Environment), and all 165 respondents' questionnaires were used to analyze attitudes and personal characteristics (see the section on Individual Characteristics and Attitudes).

#### Limitations of the Approach

The survey sample was not intended to be a simple random sample from a known population, projectable to the whole. The intention was rather to obtain a broad range of responses from a cross section of transit industry experts responsible for developing and implementing fare policies. The assumption was that these professionals' perceptions and opinions are key to understanding the use and non-use of fare differentials, without regard to evaluating the accuracy of those perceptions. The reliance on a one-shot, impersonal, self-completion questionnaire also limits the analysis in that (a) immediate, follow-up questions to probe the reasons for a response were not possible, and (b) a single observation in time does not allow either an assessment of the stability of the recorded perceptions and opinions over time, or establishment of firm, causal links between responses and subsequent agency fare policies. Nonetheless, the high response rate and the interest with which the respondents completed the lengthy questionnaire give some assurance of the reliability of the data.

#### ORGANIZATIONAL ENVIRONMENT

Four aspects of the organizational environment were examined: the overall setting for the process (moti-

vation for recent fare changes, type of policy board, fare history), the internal influences (organization, staffing, time schedule), the external influences (outside governments, other interest groups, general climate of opinion), and the administrative process. Each of these will be described further.

#### Overall Setting

The survey and secondary data addressed three elements of the setting for fare policy decisions: the motivation for the fare change, the type of policy board, and an agency's fare history.

The motivation for a fare change may have an influence on the types of alternatives that are considered and adopted. As can be observed in Figure 1, equal numbers of respondents reported that the last fare change was prompted by the normal, annual budget cycle and by a financial crisis. In only a few cases the fare change was the result of a specific, previously adopted schedule for such actions, and in even fewer cases the fare change was the result of actions of other levels of government, presumably providers of operating subsidies.

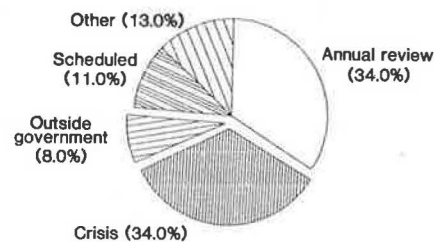


FIGURE 1 Most important reasons for the last fare change.

The respondents leave a somewhat bleak picture for the measured consideration of fare policies that depart from past practices--more than 40 percent of systems are forced into a fare change by a financial crisis or by other government agencies, and another one-third deal with fares only on an incremental, annual basis. In such settings, strategic, long-term fare planning to evaluate a broad range of innovative policy alternatives may not be possible.

Two-thirds of the agencies (43 out of 63) have policy boards with appointed, rather than directly elected, members. Such boards might be expected to be more favorable than elected boards toward innovations in fare policy because they would be more insulated from direct, adverse voter reactions. Key respondents characterized their boards as generally politically conservative or moderate, which could incline them to look favorably on cost-based fares.

There were wide variations in past fare-setting practices. Agencies surveyed had as few as one to as many as five fare changes in the 7 years for which comparable data were available, 1977 to 1984. The average was about three changes, that is, one every other year. The change in the adult base fare for these agencies during that period varied from a 50 percent reduction to a 300 percent increase, with an average change of 88 percent (or 23 percent per each of three fare changes, compounded). Although it is difficult to generalize from such widely varying data, the history appears to be one of infrequent, relatively large changes in fares. This might work against the introduction of new types of fare structures, which may need to be more frequently reexamined and fine-tuned.

### Internal Influences

Internal influences on fare policy include the number of different staff and departments involved, the speed of the policy process, and the use of outside assistance. On average, six staff members are involved in the process (mean 6.7, median 5), and it usually takes 6 months to go from initial discussion to adoption of fares. All five departments typically found in transit agencies (finance, administration, planning, operations, and public information) were mentioned as being involved in the process, but the finance or administration departments generally have the lead. The lesser role of operations and public information departments suggests that fare proposals might be developed in relative isolation rather than as part of an overall agency strategy linking service planning and marketing. In addition, the internal process is almost always the exclusive domain of staff. Most agencies (84 percent) reported that outside consultants played no direct role in the process. In general, the internal process appears to be a relatively swift administrative proceeding with few staff directly involved.

### External Influences

Outside influences on the fare process may include other levels of government, other interest groups, and the general climate of opinion toward fare changes. Outside governmental entities, principally cities, play a role in more than 60 percent of the cases (40 out of 63 transit agencies). This high level of intergovernmental activity, particularly for the larger systems, may be related to the presence of several layers of financial assistance, each of which may exact its price. It may also reflect the fact that appointed boards may include elected officials from the cities and counties in a transit agency's service area. Although involvement of many governmental agencies could complicate the fare decision process, it also offers opportunities for introducing fare differentials to meet the varying needs of the participants. This appears to have been the case in Washington, D.C. (11).

In addition to other governmental units, many outside groups could potentially be involved in the transit fare process. With five categories of outside interest groups listed in the survey (local business, news media, riders, environmentalists and unions), more than 40 percent of the agencies reported that at most one group was active. News media and riders were identified as being somewhat too deeply involved in the process, whereas business, environmental, and labor groups rarely got involved. This suggests that transit fares may not generate a great deal of general public interest, which is confirmed by only 20 percent of the agencies describing the last fare change as more than moderately controversial. Fare differentials might be more easily considered where little controversy exists.

### Administrative Process

There are many more or less standard steps in the administrative process of fare revision. Respondents were asked in an open-ended question to describe what they considered to be the most difficult steps in the process for setting fares. These were coded into seven general categories. Table 1 gives the key respondents' views of the most difficult steps in the process for setting fares. Approximately equal numbers indicated staff actions (the first three categories listed) and indicated political steps

**TABLE 1 Most Difficult Steps in Process for Setting Fares**

	Multiple Response	
	No.	Percent
Staff/technical steps:		
Initial decision	8	6.3
Rider, revenue analysis	22	17.2
Other staff, tech step	30	23.4
Subtotal	60	46.9
Political steps:		
Board action, decision	29	22.7
Public involvement	25	19.5
Other political, government	9	7.0
Subtotal	63	49.2
Other steps	5	3.9
Total	128	100.0

(the next three categories) to be the more difficult steps.

Remembering that these viewpoints are those of relatively senior respondents, this suggests that transit professionals do not view the political process as particularly burdensome. The concerns about difficulty at the staff level may be partly explained by opinions on the technical side of fare analysis (see the section on Personal Characteristics, Training, and Technical Knowledge).

### Summary--Organizational Environment

An overall picture of the transit agency fare-setting process emerges from the descriptions of the key respondents. In general, most factors examined appear to be favorable to the introduction of fare differentials, although some are two-edged.

First, the process is a relatively swift one, involving few staff, led by the finance or administration departments, and rarely using outside consultants. Although speed and a small number of active individuals create an opportunity for decisive action to introduce new fare structures, the somewhat narrow viewpoints of the lead departments and the lack of outside experts to provide new ideas may work against innovation.

Second, policy boards, which tend to be appointed rather than directly elected, are generally mildly conservative to moderate in their political leanings. A somewhat politically insulated board that is sensitive to cost-based arguments should present a good environment for introducing fare differentials.

Third, outside governmental units may often be involved in fare setting, but few outside interest groups are similarly involved. This may partly explain the relatively noncontroversial nature of fare changes. Although a political debate limited to a few groups should be more easily managed by an agency wishing to introduce a major shift in fare policy, the inclusion of other governmental agencies could severely restrict the options available.

Fourth, transit professionals view the internal, staff-level, technical steps in the process to be as difficult as the more political steps. Where staff-level steps are considered to be the most difficult, introduction of fare differentials might be relatively easier, provided that the staff had the capability to analyze such fare options.

In contrast to these factors that could favor the introduction of differentials, only a few situations existed in the policy process that appear to present substantial barriers. Where political steps are con-

sidered to be the most difficult, radical departures from current fare policies may not even be proposed. Where fare decisions are made relatively infrequently, and may often be made in response to a financial crisis or the requirements of other levels of government, little opportunity may exist to evaluate and introduce new types of fare structures.

#### INDIVIDUAL CHARACTERISTICS AND ATTITUDES

Whereas only the 63 key agency respondents were relied on for information about agency-wide processes, the responses of all 165 surveyed individuals involved in fares are important for understanding the potential influence of their characteristics and attitudes on fares. Two aspects of this point are addressed here: individual predispositions toward fare differentials (including personal characteristics, training, fundamental beliefs, and perceptions of problems and solutions) and individual evaluations of specific fare options.

#### Individual Predispositions Toward Fare Differentials

##### Personal Characteristics, Training, and Technical Knowledge

It was assumed that certain attributes of the professionals involved in the fare policy process might influence their evaluation of fare differentials. Because such characteristics exist before any specific fare policy situation, they were considered to be predisposing factors rather than direct causal influences on policy decisions. Fare differentials might be more likely to occur in agencies in which those involved in the process are younger, more highly educated, and trained in economic concepts. Younger persons are assumed to be both more highly educated and to have been trained during the period when the arguments for fare differentials have been most pronounced. One-half of the respondents are under 40 years of age, about 60 percent have college degrees, and more than one-half hold degrees in fields in which they are likely to have been exposed to economic analysis, or at least to the vocabulary of economics. All this suggests that there are significant numbers of individuals in the transit field who could be expected to understand and evaluate arguments for fare differentials.

However, beyond this general level of understanding is the need for a deeper technical knowledge in order to fully participate in the consideration of fare differentials. Four aspects of technical knowledge were covered in the survey: knowledge of elasticity (the proportional change in transit usage or revenue from a change in fares), knowledge of cost differences, sources of information, and opinions of fare analysis methods in general.

Basic to any evaluation of fare policy options is the analysis of the probable effects of proposed fare changes on revenue and ridership. Nearly all respondents said they were familiar with fare elasticity, the key concept for conducting such analyses. Although 40 percent mentioned only one of five possible types of elasticity measures, nearly one-third said that they or their agencies have used three or more measures. The measures mentioned most often were those developed specifically for their system and the Simpson-Curtin rule. [This rule of thumb (a loss of 0.3 percent in ridership for each 1 percent increase in fares) has been widely used in the U.S. transit industry since its introduction by Curtin (12).] Less often mentioned were use of measures

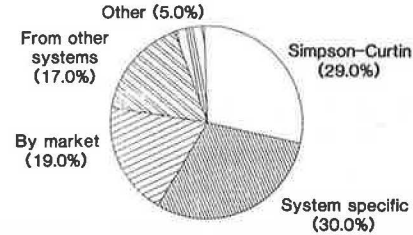


FIGURE 2 Elasticity measures known or used.

from other systems and measures broken down by ridership type (see Figure 2).

Whereas nearly all respondents knew about elasticities, 40 percent said that they or their agencies had not determined the costs of providing different types of services, a key ingredient in developing cost-based pricing differentials. For those who responded, cost distinctions by service type, route, and fixed versus variable categories were mentioned about equally. Determining average versus marginal costs was mentioned least frequently, which implies that the distinctions mentioned were probably based on systemwide average costs (see Figure 3).

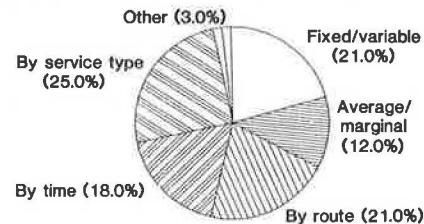


FIGURE 3 Cost differences known or used.

Four different information sources on fares were listed (colleagues within the agency, colleagues outside, professional journals, and research reports). Relying on colleagues, in and outside the agency, was mentioned most often (68.7 percent), with research reports ranked third (19.1 percent). More than 60 percent reported only one or two sources of information. Fewer than one-quarter could name any specific journals or reports that they found helpful (see Figure 4).

One-third of the respondents mentioned some direct involvement in federally sponsored activities relating to fares. This survey was conducted after the 1983 teleconference on Transit Fare Policy and Pricing, but before the introduction of UMTA's Pricing

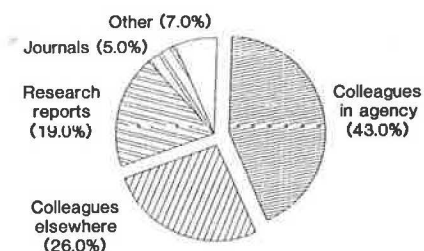


FIGURE 4 Sources of information on fares.

TABLE 2 Assessment of Fare Analysis Methods

Do you agree or disagree that:	Strongly Disagree (%)	Mildly Disagree (%)	Mildly Agree (%)	Strongly Agree (%)	Total (%)	No.
Available methods are reliable	8.9	25.3	58.9	6.8	100.0	146
Never enough good information	6.7	20.7	46.0	26.7	100.0	150
Available method easy to explain	14.0	43.4	37.8	4.9	100.0	143
Need simpler, quicker methods	5.2	24.4	42.2	28.1	100.0	135
Nobody understands how people respond to fare changes	10.6	33.1	43.7	12.6	100.0	151

Resource Center technical assistance program. However, based on this response UMTA's formal conference and report publication approach does not appear to have reached as many of the target professionals as might have been expected, given the continued emphasis UMTA has placed on the subject.

Transit professionals appear to be ambivalent about the technical tools of the trade for predicting the impact of fare changes (see Table 2). Even if transit professionals are knowledgeable and well informed, they need to have confidence in applying the available analytical methods to complex fare differential proposals. This includes the base data available for analysis, the specific types of elasticity measurement used, the mathematical form of the predictive models, and the computational environment. Although they consider the available methods to be generally reliable ("as reliable as can be expected"), the respondents also believe that they are not easy to explain and need to be simpler to use. Further, reflecting perhaps on the aforementioned situation of having to conduct analysis under time pressure, they agree that there is never enough good information for a thorough analysis. Surprisingly, more than one-half agreed that not enough is understood about how people respond to fare changes, implying that current models may be inadequate representations of reality. This ground appears to be fertile for development of new analytical tools.

#### Fundamental Beliefs

In addition to personal characteristics, another set of potential predisposing factors is that of fundamental beliefs about how certain aspects of fare policy are or should be considered. Such beliefs are presumed to be relatively stable over time, as opposed to opinions about specific, current issues that might be more easily changed. Three such beliefs were examined in the survey: conceptions of equity in fares, the role of politics versus technical considerations in fare decisions, and the service versus economic view of public transit's role.

One of the recurring concerns in fare policy formulation is that the resulting fare structure must be equitable, but there are no universal standards for judging equity. To understand how transit professionals perceive the term, respondents were asked to choose among alternative definitions of equity. The most frequently mentioned responses were those definitions that dealt with equally sharing the cost of services and with basing fares on value or benefit received (see Tables 3 and 4). Nearly 90 percent of respondents mentioned either or both of those views of equity. Either one may be considered consistent with support for fare differentials.

Relatively few preferred definitions dealing with ability to pay or with lower fares for the disadvantaged. Similarly, respondents were virtually unanimously opposed to allowing discount fare recipients to ride free during the off-peak periods,

TABLE 3 Views on Equity in Fare Setting: Meaning of Equity

	Most Important		Multiple Responses	
	No.	Percent	No.	Percent
Ability to pay	9	5.9	24	10.2
Value/benefit received	53	34.6	84	35.7
Sharing cost equally	68	44.4	87	37.0
Lower fare for disadvantaged riders	3	2.0	20	8.5
Other	20	13.1	20	8.5
Total	153	100.0	235	100.0

TABLE 4 Respondents Mentioning Economic-Based Views of Equity (value received or cost-sharing)

	No.	Percent
Mentioned neither	22	13.3
Mentioned either one	115	69.7
Mentioned both	28	17.0
Total	165	100.0

or basing fares on rider incomes. According to comments frequently volunteered by respondents, this was due to their perception that transit agencies have been forced to provide a social welfare function that rightfully belongs to other agencies and levels of government. More than 60 percent of respondents agreed that direct user-side subsidies to low-income persons, an often-mentioned but little-used technique, should eventually replace general fare discounts.

Table 5 gives respondents' beliefs about two other

TABLE 5 Views on Politics and the Role of Transit

	No.	Percent
How much do political or technical considerations determine fare structures?		
Entirely based on technical consideration	2	1.2
Mostly technical, some political	56	34.6
About evenly split, technical and political	58	35.8
Mostly political, some technical	46	28.4
Entirely political	0	0
Total	162	100.0
How should public transit be viewed?		
Treat transit like other service-oriented government functions, such as police and fire	59	36.4
Treat transit like other economic-oriented government enterprises, such as water or other utilities	75	46.3
Combination of the two	28	17.3
Total	162	100.0

ideological perspectives affecting fares. First, respondents are nearly evenly split on whether fare decisions are mostly influenced by politics, technical issues, or a mixture of the two. Those who believe politics is relatively more influential may perceive that there are too many political uncertainties or risks involved in pursuing innovative pricing proposals. However, the even distribution suggests that there are few cases in which technical judgment is thrown to the wind; no respondents believed that decisions were purely political. The respondents appear to have a realistic expectation that technical analysis can influence fare decisions, but that it will be balanced by political considerations.

The second perspective is the view of transit primarily as a public service, such as police or fire, or more as an economic enterprise. Respondents appeared to lean toward the economic orientation, consistent with their previous ranking of revenue generation as a key objective. However, nearly as many endorsed the service orientation, and some believed that transit should be viewed as a mixture.

It might be expected that those who believe both that technical considerations influence fare decisions and that transit should be viewed as an enterprise would be most favorable toward differential pricing.

#### Perceptions of Problems and Solutions in Fare Policy

The final set of potential predisposing factors that was considered was the respondents' opinions on a number of fare policy issues: objectives, constraints, practical implementation concerns, and financing. The data in Tables 6 and 7 indicate that transit professionals are principally concerned with the revenue generation objective of fares. In keeping with their views on equity, respondents were less interested in using fares to provide mobility for low-income riders. Respondents were also less interested in using fares to change automobile or transit travelers' behavior. More than one-half of them believe that fares should encourage new ridership and that fare simplicity is a very important objective, and 87 percent agree that fares should be

aggressively used to market transit. Most respondents agreed that fares should be regularly increased to cover increasing costs (88 percent), and many believed that further subsidy cuts will lead to more fare increases (74 percent). Many also agreed that continued fare increases will bring large losses in ridership (59 percent). Still, most believed that all other revenue sources and cost reductions should be pursued before increasing fares (75 percent), and few would tie fare increases to service improvements (37 percent). On practical matters in implementing fares, respondents were most concerned with the ease in marketing and in the perceived limitations imposed by existing fare collection equipment.

The impression created from these responses regarding fare policy objectives and constraints is that fare increases are viewed in two somewhat contradictory ways. First, fare increases appear to be a necessary evil, a duty that must be done only when absolutely necessary, with full knowledge of the likely adverse consequences. The second view is a more positive one of using fares to attract riders and to market transit service as a desirable product. To the extent that fare differentials are viewed as a means of more effectively addressing both concerns (revenue and ridership), these opinions may be considered favorable toward differentials. However, if fare differentials are perceived as being inherently complex, proponents will have to address the concerns expressed about simplicity, marketability, and feasibility with existing fare collection equipment.

With budget constraints always a concern, respondents' attitudes toward two aspects of transit financing were explored in the survey: farebox recovery (the proportion of operating expenses covered by fare revenue) and subsidies. Respondents would favor 40 percent farebox recovery ratios, although the average actual recovery for these agencies is barely one-third. Few believed that transit should try to return to the days of recovering most expenses from the farebox. When asked whether seven sources of revenue, including fares, should be increased, decreased, or kept at current levels, respondents on average believed that three of those sources (gasoline taxes, automobile fees and tolls, and sales taxes) should be increased to fund transit. Professionals appear to be in agreement with the view that transit should be funded from a mix of sources,

TABLE 6 Opinions on Objectives of Establishing Fares

How important are these objectives in establishing fares?	Not Important (%)	Somewhat Important (%)	Very Important (%)	Total (%)	No.
Provide mobility for disadvantaged	15.4	49.4	35.3	100.0	156
Achieve revenue generation targets	1.2	24.7	74.1	100.0	162
Encourage new ridership	3.1	46.0	50.9	100.0	163
Keep fares simple	4.9	42.3	52.8	100.0	163
Reduce automobile use	16.0	55.6	28.4	100.0	162
Induce riders to change behavior	28.8	54.9	16.3	100.0	153

TABLE 7 Opinions on Fare Policy Issues

Do you agree or disagree that:	Strongly Disagree (%)	Mildly Disagree (%)	Mildly Agree (%)	Strongly Agree (%)	Total (%)	No.
Fare should be regularly increased	1.8	10.4	50.0	37.8	100.0	164
Improve service first	15.6	46.9	24.5	12.9	100.0	147
Use fares to market transit	2.0	10.7	57.3	30.0	100.0	150
Reduce costs, raise other revenues first	3.1	22.0	37.7	37.1	100.0	159
Subsidy cuts increase fares	5.7	20.1	47.8	26.4	100.0	159
Fare increase means large rider losses	4.6	35.9	32.7	26.8	100.0	153

with riders shouldering less than one-half of the burden. If fare differentials are viewed as a way to enhance farebox recovery, then those who favor increasing the typical recovery ratio to 40 percent would also favor differentials. Those who favor increasing several subsidy sources rather than fares might be expected to be less favorable toward differentials.

#### Evaluation of Fare Differential Options

The predisposing factors described were proposed to set the stage for the transit professionals' evaluations of fare differentials. The data in Table 8 indicate the broad support that fare differentials have. Respondents were asked if they believed that each of five kinds of fare differentials was a good or bad idea for an ideal fare structure. According to the responses, 80 percent or more believed distance, time, quality, and cost-based fares were each good or very good ideas. Only in the case of fares based on rider incomes was the response reversed, with 80 percent of professionals believing it to be a bad idea. As noted in the discussion on equity, they reported that this is primarily due to their belief that social service agencies are more appropriate sources for such income-based programs. A summary variable counted mentions two of the most economically based differentials, time-of-day or cost-based fares, as good ideas. More than 60 percent of professionals believe that both are good or very good ideas; nearly 30 percent more said that one or the other was a good idea; only 8.5 percent did not mention either. Thus, despite the relatively low incidence of multiple fare differentials in practice, transit professionals are both aware of them and agree in principle that they should be part of an ideal fare structure. The long-standing arguments promoting fare differentials have apparently been effectively transmitted to transit professionals.

TABLE 8 Evaluation of Fare Differential Options

Would it be a good or bad idea to vary fare according to:	Very Bad	Bad	Good	Very Good	Total (%)	No.
	Idea (%)	Idea (%)	Idea (%)	Idea (%)		
Distance	0	8.3	52.6	39.1	100.0	156
Service quality	5.1	16.7	59.4	18.8	100.0	138
Time of day	4.1	9.5	57.1	29.3	100.0	147
Rider income	34.4	45.7	17.9	2.0	100.0	151
Cost of service	2.6	13.8	55.9	27.6	100.0	152

#### Summary--Transit Professionals' Characteristics and Attitudes

Transit professionals involved in the fare process appear to be capable of accepting more differentiated transit pricing in terms of their general attitudes, fundamental beliefs, specific opinions, training, and knowledge. They overwhelmingly support most kinds of differentials, and they are generally comfortable with the analytical terms and tools to handle the requisite analyses, although they recognize that fare analysis methods need to be improved. They report using relatively few sources of information about fares, yet they are well aware of and support fare differentials. This suggests that transit professionals are similar to practitioners in other fields in which ideas from the research literature are informally and unsystematically absorbed in the course of daily work. Transit professionals would

favor fundamental changes in fare policies (e.g., more frequent fare increases, reduced use of discounts, and higher fare and farebox recovery levels). However some expressed concerns that potentially limit the application of fare differentials, including concerns about the marketability to the public of more complex fares and the ability of fare collection equipment to handle new fare structures.

#### CONCLUSIONS

##### Main Findings

In the first place, two current stereotypes have been both confirmed and challenged. The vision of the fare-setting process as an irrational, unpredictable enterprise driven by narrow political interests is rarely found to be tenable. More often, the process is a fairly swift administrative one; a policy board makes choices from a range of options developed by professional staff who are cognizant of the interplay of political considerations. Still, the observation that fares are politically set must always be true to the extent that it is the responsibility of the policy boards to apply their judgment of political and social equity to the technical analysis of options posed by staff.

Another view that also must be discarded is that transit professionals are in a stodgy, conservative industry in which no one is interested in change or new ideas. Regardless of rank, tenure, education, or function, these professionals strongly support basic changes in fare policy and structure, including increased use of fare differentiation, to improve the fiscal viability of these agencies. However, as practicing professionals rather than theoreticians they balance their support with concerns about the adequacy of their analytical tools to provide the necessary guidance, the marketability of fare differentials to the public, and the ability of their fare-collection systems to adapt.

It has already been observed that transit professionals are well aware of the idea of fare differentials, so the first step in the information channel is not a problem. Awareness and agreement were so great that fare differentiation may now have to be considered part of the socialization of transit professionals. The years of repetition about what should be have apparently sunk in--they know what they ought to know.

For almost all of the other major components of the framework as well, the findings appear to indicate potential for increasing the use of fare differentials. Individual professionals involved in the process appear to have the knowledge, abilities, opinions, and beliefs to support increased use of differentiated pricing. A relatively benign decision environment exists for pursuing innovative policies (appointed boards may be more accepting of new policy directions, involvement of relatively few staff and departments simplifies internal decisions, and few outside groups are actively involved to complicate the process). However, a history of infrequent, large fare changes and a reactive orientation (fare policy as a result of incremental, annual decisions or in response to a financial emergency) may work against differentials.

The combination of these attitudinal and institutional factors appears generally to be favorable toward time-of-day pricing and multiple differentials, yet these policies are not widely followed. If almost all the pieces to support fare differentials are in place, but differentiation is still uncommon, then what is left out must be critical.

The data suggest that there may be mundane reasons

why this general support for fare differentials may not often get translated into practice. Although transit professionals know what should be done in principle, it is far more difficult to know when and how to implement fare differentials.

#### Technical Issues

The professionals must be able to explain to policy makers the consequences of various options. However, respondents reported some lack of confidence in the methods available for fare analysis. The analytical demands for evaluating fare differentials are considerable; more disaggregated data on service costs and ridership demand than are usually maintained in agency files may be needed, and efficient methods for analyzing the more detailed data are often lacking. This situation is compounded by fare policy decisions being made in a short-term or crisis context rather than as part of a long-term, strategic integration of fare policy, service planning, and marketing. There is great pressure on staff to provide a projection of revenue generation that is as accurate as possible. The immediacy of the policy needs drives the analytical approach into the position of having to rely on proven methods, rules of thumb, and data that are easily available. Introduction of unfamiliar terms and methods under this kind of pressure could introduce additional risk into a financial picture already full of uncertainty.

One area in which some change may be possible is in the ongoing professional education of people in transit. There was an uneven response in the national survey on the frequency of agencies actually calculating the relevant cost differences. This suggests that there is a particular need to help transit professionals analyze the cost structure of their services so that they would be able to examine the consequences of applying cost-based pricing.

In response to the survey's open-end questions about issues concerning opportunities for and obstacles to more innovative pricing in transit, one of the problems mentioned frequently was the difficulty in analyzing the trade-offs and disaggregate impact of fare structure, ridership, revenue generation, farebox recovery, and subsidy levels. The emerging development of interactive computer models to compare fare policy options is promising, but their success (presuming they are technically correct and substantively appropriate) may depend on how they are disseminated. Based on the previous observation that transit professionals prefer face-to-face exchange of information, training to develop in-house analytical capabilities in all aspects of fare analysis would appear to be a promising direction for additional federal support. Workshops at industry conferences, traveling training courses, and site visits may thus be the most effective ways of introducing these new tools after they are developed.

Furthermore, given the wide variations in the details of fare structures to meet local requirements, any fare policy model must be easily adaptable by the transit agency staff so that the analysis can be fit to the situation, rather than the other way around. It would behoove developers of such tools to work directly with transit professionals in the initial structuring of what a policy-relevant fare model is supposed to do in the first place.

The other critical requirement for such models is the ability to quickly update them, modify assumptions, and test multiple options in real time. Given the reported frequency of fare changes that respond to financial crises, a great premium must be placed on tools that allow the fastest possible turnaround

of analyses that directly address the relevant policy choices. It is not enough to complain that time constraints preclude the analysis of more sophisticated policy options. The methods must be retooled to fit the time demands of the task.

#### Operational Feasibility

Even if there were no analytical problems, the concerns about operational feasibility would similarly run up against the time pressures just mentioned. The most frequently mentioned obstacles and opportunities for innovative pricing were in the areas of fare-payment methods and fare-collection equipment. Fare-equipment limitations had been cited in the national survey by 46 percent of respondents as very important and by 41 percent as somewhat important in establishing fare structures. Research and development on practical and reliable on-board bus fare-collection equipment is continuing, but this and further evaluation of self-service fare-collection procedures may be among the most critical factors limiting more finely differentiated fares. It is simply not possible in the short run for a transit agency to independently undertake research and development on new fare-collection technologies. The federal government has sponsored such efforts in demonstrations, and various equipment suppliers are undertaking their own research; however, transit agencies do not have the time, staff, or budget to seriously consider short-term changes in their fare-collection equipment.

Some types of differentials may not actually require new technology (e.g., time-of-day fares can be implemented in some cases by operational rules alone), but the pervasive perception of professionals is otherwise. If nontechnological options for implementing fare differentials can be identified, they should be more widely explained to professionals. If fare differentials can be proposed that do not require equipment changes, they may be more likely to be considered.

#### Marketability and Simplicity

Transit professionals appear to believe that differentials are inherently complex, and therefore violate one of their primary fare policy objectives--simplicity. More than one-half of the respondents to the survey said that keeping fares simple and understandable is a very important objective. It took 65 pages to describe a recent fare structure for Washington (in Tariff Number 13, Tariff of the Washington Metropolitan Area Transit Authority on Metrorail and Metrobus Operations within the Washington Metropolitan Area, June 30, 1984); however, this apparent complexity may be deceiving. An individual traveler has to learn only the fare for his trip; transit operating personnel have to know only the fares for the routes they serve. The fear of overly complex fare structures is puzzling, given the generally accepted levels of pricing complexity in everyday life, for instance, with telephone toll calls or postal rates. Travelers may be more amenable to complex fare structures than transit staff and board members believe, if those travelers believe that fares are fairly set and if they are informed about the basis for differences. More market research work must be done to determine whether this penchant for simple fares is justified.

Even if an agency wishes to plunge ahead with differentials, lack of experience with them may create problems in marketing that would have to be thought out ahead of time. Few agencies would have



ready-made market research data for planning their marketing strategy for differentiated fares. Again, it would be impossible for most agencies to thoroughly assess marketing options for fare differentials in the short time usually available for fare analysis.

#### Directions for Further Research

##### Need for Fare Policy Decision Framework

Despite all the promotion of fare differentiation, there is no accepted way to specify the circumstances under which a particular fare differentiation strategy or combination of strategies will produce the most desirable results. This research examined only where fare differentiation is used, not where it should be used. It is entirely possible that current practices differentiating fares are inappropriate; the circumstances under which multiple differentials are warranted, for example, may be limited. Clearly, if a transit system has no particular peaking pattern, time-of-day pricing would make little sense. Similarly, if average trip lengths are short, zone structures would accomplish little. Not only is there no agreement on which fare differentials to apply, there is also little agreement on the ideal magnitude of differences. For instance, respondents to the survey said that the maximum number of zones in a system should be anywhere from 1 to 20 and the zone size from 2 to 15 miles. There can be no standard advice here, but there is a truism: for fares to vary, services or costs must vary.

A favorite policy analytic technique turns the tables on a proposal by asking, If X is the answer, what is the question? (This approach, if not pioneered, was at least broadly practiced by Aaron Wildavsky, among others.) As with any other public policy tool, fare differentiation cannot be a universal technique, suitable in all places and at all times. Every technique has its merits and limitations. What problem does fare differentiation solve? Others have demonstrated that efficiency, equity, or both may be improved by introducing fare differentials of various types. However, a framework for fare policy decision making is completely lacking that systematically leads an analyst or policy maker through the difficult trade-offs among efficiency, equity, and simplicity, while accounting for the real costs of implementing various differentials. If more rational decisions are to be made, they can only occur when the expected benefits are lined up against the total costs of implementing differentials (capital costs for equipment, changes in operational efficiency and schedule adherence, transaction costs to operating personnel and travelers, and gains and losses in political capital). If this kind of information is unavailable to decision makers, one cannot complain about a lack of rationality in fare decisions. Providing such information and an integrating framework is a daunting challenge for further research.

##### Remaining Research Agenda

Other areas for further research suggested by this analysis would include the following: (a) pursuing the initial self-completion survey with more in-depth interviews to explore why the transit professionals held certain opinions; knowing the opinions alone and not the reasons for them is a serious shortcoming of this analysis; (b) expanding the framework by soliciting the ideas and opinions of other persons in the fare policy process, partic-

ularly policy board members and riders; and (c) structuring more controlled demonstrations of fare differential options to develop more concrete how-to information and to determine if there are optimum mixes of different types and levels of differentials to meet different policy objectives; optimum in this sense must include a political as well as an economic dimension.

##### Overall Conclusions

The overall conclusion is that attitudinal and institutional factors do help set the stage for transit fare differentials. In a sense, they may be the necessary, but not sufficient, conditions for adopting such fares. The critical point appears to be with the more pragmatic problems of analysis and implementation. Proponents of fare differentials therefore no longer need to complain that they are not being heard by transit professionals. Instead, they should start addressing these practical issues that have been largely ignored in the literature. However, even if all of those issues were addressed, universal application of fare differentials would not result. In reaching fare policy decisions, policy makers will merge the new factual information with the much more subjective evaluations needed to reach a political consensus that meets local needs.

What explains the apparent non-use of differential pricing in transit? It is neither ignorance nor obstinacy, but three rather simple factors that may govern the outcome:

1. The policy advice may not fit where cost, service, or market variation is limited.
2. The policy advice cannot be convincingly substantiated to staff, policy makers, or the public because of lack of data or lack of confidence in analytical tools.
3. The practical implementation problems (fare collection equipment and procedures, burden on operating personnel, marketability) are not considered or are understated.

The gratifying conclusion is that there is a community of interest among theorists, applied researchers, professional practitioners, and policy makers to take positive steps to respond to these issues.

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## An Initial Analysis of Total Factor Productivity for Public Transit

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### ABSTRACT

Improvement of transit performance depends first on the ability to measure performance levels. Introduced is the concept of total factor productivity as a unified measure of transit performance. This concept uses the shift in the cost function as the measure of change in productivity. A three-stage least-squares estimation procedure was used to estimate model parameters. The technique was applied to 20 transit systems. Data were analyzed for the most recent 26-year period. Results indicate that there are no consistent trends in total factor productivity. Productivity appears to increase and decrease in similar amounts year by year, indicating that there is little change. This supports the hypothesis that little technological improvement has occurred in the industry and that management decisions tend to compensate for productivity changes so that productivity remains stable over time when total inputs and outputs are investigated.

The ability to improve transit performance relies to a great extent on the ability to measure it. This need for performance measures has led to the development of a large number of ad hoc productivity, efficiency, and effectiveness measures. A measure of productivity is suggested that (a) is derived from economic theory, and (b) consistently traces changes in productivity (which includes all the relevant inputs and outputs). The method is total factor pro-

ductivity and its application in this paper is based on the cost function approach and not the production function approach, which assumes constant returns to scale.

### REVIEW OF LITERATURE

Among the pioneering work in transit performance analysis is Tomazinis's research, which specifies a set of indicators to be used in measuring partial productivity and efficiency (1). Following Tomazinis, a number of studies have been conducted, all of which attempt to offer explanations for productivity

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