Evaluating The Distributional Consequences of Local Service Delivery Systems—An Alternative Perspective#

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I. INTRODUCTION

Local government directly or indirectly provides a menu of services to achieve desirable social or environmental conditions. The provision of local services is potentially distributive in nature because of differences in needs and preferences for publicly provided goods, differences in individual tax burdens supporting public goods provision, and because local public services are, for the most part, quasi-public goods. For these reasons some individuals or groups of similar individuals may be treated more favorably than others under a service delivery system. The issue of service equity is concerned with the fairness of the distributional consequences of local service delivery systems.

Local service delivery systems are complex because they involve embedded processes (Hirsch, 1968; Bradford, Malt and Oates, 1969). There is a frequently studied production process that uses labor and capital to transform other resources into intermediate outputs. These intermediate outputs in turn, interact with environmental conditions through a less clearly defined (frequently ignored) second transformation process to create altered social conditions: Increased safety, health, and human potential are examples of the final outcomes from service delivery.

The complexity of the service delivery system has fostered confusion among interested economists, policy analysts and political scientists about what should be analyzed when evaluating the equity of service delivery. Specifically there are questions concerning unit of measure and unit of analysis that need to be addressed before meaningful evaluation of distributional consequences can be accomplished (Savas, 1978 and Lineberry, 1974).

Not surprisingly, past studies have reported contradictory conclusions about distributional consequences. It is unclear whether patterned or unpatterned inequality exists in service delivery (Rich, 1979). Patterned inequality exists if there are systematic differences arising from service

delivery related to suspect socioeconomic characteristics, e.g., race. Unpatterned inequality exists when differences from service delivery are randomly distributed. The weight of the limited evidence available suggests that differences from service delivery are randomly associated with race and income, that is, unpatterned inequality exists in service delivery (Coulter, 1980 and Lineberry, 1977). Because of the confusion about measures and unit of analysis this conclusion is tentative at best, however. Further analysis of service delivery systems using alternative equity norms is warranted.

With respect to measures it is evident that convenience and data availability have led many investigators to judge the equity of service delivery by using the distribution of resources or direct inputs, often measured by expenditures. Our legal system, in particular, has been prone to use such indices of comparative service levels in deliberations involving unconstitutional inequality (Beal v. Lindsay, 1972; Serrano v. Priest, 1971; Baron, 1971 and Weicher, 1971). The use of expenditures or direct inputs is an admittedly indirect way of getting at service outcomes and is usually justified by implicitly assuming that outcomes are proportional to the resources used. It can be expected, nonetheless, that input measures such as expenditures inadequately reflect service outcomes because they do not account for all of the intervening factors, captured by efficiency and effectiveness aspects of service delivery, between inputs and what is important to individuals—the impact of local services on social states (See Lineberry, 1974). Partly in reaction to this, some investigators have used measures of service activities and their direct results (e.g., frequency of pickups or patrols, tons of garbage collected) to gauge equity in service delivery (Coulter, 1980; Nivola, 1978 and Mladenka and Hill, 1978). Unfortunately these are measures of intermediate outputs of a service delivery system and, like inputs, are not of direct interest to individuals.

From this perspective it can be argued that the demand for inputs and intermediate outputs is a derived demand and that the distribution of these may not be relevant when making equity judgments about service delivery. The goals underlying collective action encompass similarity in the context of final service outcomes rather than inputs or intermediate outputs used in the delivery process.

Previous studies have also emphasized geographic distributions: expenditures per neighborhood and patrols per day per block are examples (e.g., Lineberry, 1977 and Weicher, 1971). One possible rationale for such an approach is provided by the observation that like people tend to locate together, suggesting that geographic equity will impart equal treatment to individuals. Perusal of the most basic demographic data demonstrates that this premise is false. Simply consider the demographic heterogeneity that exists within census blocks and tracts, let alone larger areas that may define a neighborhood. Because of this heterogeneity it can be expected that the equal treatment of a set of geographic units will often result in the unequal treatment of individuals or groups of similar individuals (Lineberry, 1974, 44-45).

Examination of the production process for local services and the purpose underlying collective action suggests that the goal of equity in service provision should involve consideration of the impact of services on environmental or urban conditions, that is social states of individuals. Urban conditions such as accessibility, safety, health and human potential are most directly linked to individuals rather than places or things. Routine services (e.g., shopping, streets), protective services (e.g., police and fire protection) and developmental services (e.g., education and health services) are oriented towards satisfying the needs, expectations and aspirations of individuals with respect to these and necessarily should be evaluated with them in mind.

Regardless of the measure used, equity has typically been defined in an ex post sense. Ex post equity exists if each unity of analysis experiences the same event or outcome. Ex post equity is backward looking. Using this concept of equity previous studies of service delivery systems have asked whether the geographic distribution of absolute levels of local resources or intermediate outputs is uniform. Because of possible variations in need and tax burdens across individuals, and idiosyncratic individuals it is not evident that an ex post equity norm based on inputs or intermediate outputs is meaningful for evaluating the distributional consequences of service delivery systems. In particular, the constraints on collective action and the pluralism that exists at the local level suggest that an ex ante norm may be more meaningful in evaluating and explaining distributional consequences of local service delivery. Ex ante equity exists if the probability of an event or outcome is the same for every individual. Ex ante equity is forward looking.[1]

The discussion summarized in this paper is intended to develop a rationale and alternative empirical basis for evaluating equity of service delivery in terms of service outcome, using an ex ante equity norm based on citizen evaluations. The service delivery system is discussed in Section II, with the intent of highlighting the embedded production process already alluded to. The relationship between expressions of satisfaction and relative service outcomes is discussed in Section III and how expressions of satisfaction can be used to evaluate the distributional consequences of service delivery is outlined in Section IV. An analysis of data for Wichita, Kansas is summarized in Section V. The application is rather straightforward and suggests that the information contained in citizen evaluations of local services has not been fully exploited by policy analysts. Section VI concludes the discussion with some observations about implications and future work involving intercity comparisons.

II. THE SERVICE OF DELIVERY PROCESS

Many of the conceptual and empirical problems associated with evaluating the equity of local service delivery can be succinctly identified by considering the transformation process underlying the provision of local service. It is an embedded transformation process that includes a conceptually well-defined production function and a less well understood, but

equally significant, transformation process which results in altered social conditions, the things which are of direct concern to individuals (See Oates, 1981; Bradford, Malt and Oates, 1969; Hirsch, 1968; Jones, 1977; Rich, 1977 and Jones and Kauffman, 1974).

For simplicity, consider a set of primary inputs, Z, a set of intermediate outputs, Q, and a single final outcome C, which measures a social state such as safety, accessibility or human potential. Assume also that Q and C are service specific, that is provision of a local service involves producing a particular Q to influence a specific C. Q is the direct result of a traditional production process involving Z. Thus, we may write

(1) $F(Q,Z) = O$

where F( ) possesses all of the appropriate properties of a neoclassical multiple output production function. The exact form of F(.) is determined by production conditions, that is F(.) may be specific to a neighborhood or geographic region. Technological optimization insures that for components of Q and Z, say Q_j and Z_i, $\delta Q_j/\delta Z_i > 0$; that is Z_i is effective in producing Q since increases in Z_i result in increases in Q_j. In the case of public transportation for example, Z would include labor, capital and resources in the form of men, buses and energy supplies while Q, the set of indirect outputs, would include frequency of bus service and quality attributes (e.g., lifts for the handicapped) each defined for a specified area and time period. Q is not of direct interest to individuals, however. Presumably accessibility is, to use our example above. Thus we must also consider a second transformation process which includes Q as an input along with a set of environmental conditions, E. These factors interact to determine C, a final service outcome; e.g., accessibility. In more explicit form, we have an embedded production process
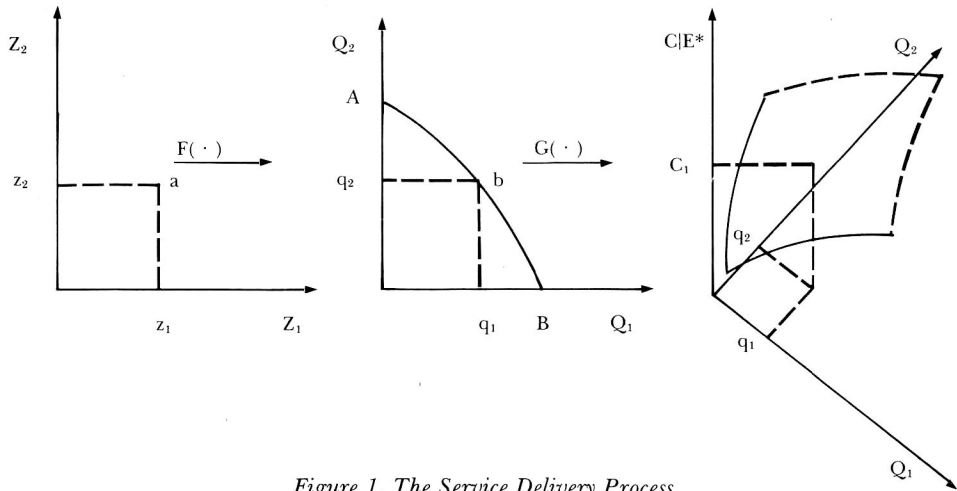

Figure 1. The Service Delivery Process

$$(2) \qquad\qquad C = C\big[F(Q, Z), E\big]$$

where F( ) is embedded in the second transformation process C( ). The properties of C( ) have not been studied in great depth, and they are not well understood (Oates, 1981). Presumably, if the service is effective $\delta C/\delta Q_j > 0$, all j. This indicates that an increase in intermediate outputs improves the social state defined by the final outcome, C.

Graphically the service delivery process summarized by C( ) involves the mapping or transformations depicted in Figure 1.

A given combination of inputs, "a" for example, is transformed by a traditional production relation into a set of intermediate outputs, "b." This set of activities is not unique, but is chosen implicitly through some local decision-making process from the infinite set of intermediate output vectors, AB, associated with the single set of inputs, "a." Point "b" is determined by F( ) and how Z is used in production by choice of a service agency. A second transformation process translates the set of activities or results into an altered social state or final outcome C_1. Environmental conditions are assumed given and equal to E*. It should be noted that since environmental conditions, E, are exogenous, C is technologically determined given the choice of Q.

More importantly for analyzing equity of service delivery systems is the realization that environmental factors, the E's, vary across individuals or groups of similar individuals. Thus, even though a given Q and E is associated with a unique C, the C's may vary across individuals given a single value for Q (i.e., equal Q's) because of the variability in E. Everyone may receive the same level of intermediate outputs of resources (as in the case of pure public goods) but not experience the same final outcome, C, because of the intervening influence of environmental factors.

Herein lies the difficulty in evaluating the equity of a local service delivery system. Should equity be evaluated in terms of inputs, intermediate outputs or outcomes, that is Z, Q, or C? The preceding discussion emphasizes that these are not equivalent empirical approaches to measuring equity. Conclusions about service equity and, therefore, policy implications and recommendations about service delivery can be quite divergent depending on whether the distributional evaluation is based on inputs, intermediate outputs or outcomes. For this reason it seems prudent to develop and apply alternative equity norms for evaluating service delivery systems. The premise underlying the subsequent discussion is that the *relative* distribution of C, final service outcomes, is an appropriate base for defining an equity norm and evaluating distributional consequences of service delivery because dissatisfaction with initial (pre-service) values for social states provides an impetus for collective action.

III. SERVICE SATISFACTION

Conceptually, a decision to undertake collective action to initiate or ex-

pand the provision of a local service is based on a belief held by individuals that by acting together they can alter an initial or presently existing social state (C_0) in a favorable manner, to their net benefit. Each individual, in deciding whether or not to "join" under a social contract, compares an initial social state with what can be expected after collective action (the final service outcome, C) adjusting for any private costs (e.g., taxes imposed) of course. If a nonnegative fiscal residual is expected then an individual will join and agree (vote yes) to initiate or expand service.[2]

If made explicit, it seems reasonable to expect that the social contract legitimizing collective action would include a specification of the rules to be used in reaching a collective decision (i.e., the voting procedures) and a statement of commitment on the part of the collective body to fulfill the expectations of individuals comprising it. In reality individuals are rarely given an opportunity to join under, or change the conditions of a social contract except indirectly, through a voting mechanism or by location: choice of residence, for example. The ability to make locational adjustments may be severely constrained by income or other factors such as discriminatory practices in housing markets, however, and referanda are periodic and infrequently tied to specific service decisions. For these reasons, there is an additional responsibility on the part of the collective body (service agency) to attempt to satisfy, at least minimally, the expectations of individuals concerning the outcomes from service provision.

Because the expectation of a nonnegative fiscal residual is pivotal to individual decisions to support collective actions, it seems reasonable to use a comparison of final outcomes (C above) with minimally required outcomes (C_{min}) to judge the relative fairness or equity of a service delivery system, that is, what happens from collective action relative to what is minimally required to support collective action. It must be concluded that there exists unequal treatment of individuals in a group if they consistently confront relatively lower probabilities of achieving minimally required results (i.e., nonnegative fiscal residuals) from collective action. What ethical justification can there be for such differences? What explains such differences?

Final service outcomes result from the production process summarized in equation (2), while minimally required service outcomes, C_{min}, are determined by underlying individual preferences and tax costs. For a person in a single-service jurisdiction C_{min} is that level of social state C such that the area under the relevant marginal benefit curve between the initial social state, C_0, and C_{min}, is equal to the tax-cost, T, imposed on the individual to support the provision of Q to improve C. C_{min} is defined so that the fiscal residual from collective action is zero, that is, the individual is indifferent between receiving C_{min} or retaining the tax-cost for private purposes. For individuals to know C_{min} in this simple case it is necessary that they be aware of their own preferences and have knowledge of their tax-costs.

The information requirements and calculations are somewhat more complex for individuals in a multiservice jurisdiction because there is an allocation problem between services or social states which must be re-

solved. For a person in a multiservice jurisdiction to identify the set of C_{min}'s it is necessary that (i) total individual benefits, in this case given by the sum of areas under the relevant marginal benefit curves be equal to the total tax cost imposed on the individual to support the provision of services influencing the different social states and (ii) marginal benefits per last tax dollar allocated to each service must be equal. To carry out these calculations it is requisite that individuals have knowledge of the underlying production processes and input market conditions, also.[3]

Comparisons with other individuals and their social states, that is relative service deprivation, may influence the calculations identifying C_{min} (s) by shifting the relevant total and marginal benefit curves. Individuals may perceive themselves as being worse off if their social states don't improve when conditions elsewhere improve. As relative service deprivation increases the marginal benefit curve shifts inward (i.e., the total benefit curve rotates down) implying an increase in C_{min} for a given tax cost.[4]

Unfortunately minimum required outcomes are nonobservable and final outcomes may be unmeasurable. An indirect method of observation must be adopted to deduce their relation. An obvious circumvention is to determine who is (or who is not!) satisfied with a particular service. Those who ultimately benefit from service outcomes equal to, or in excess of the minimum requirement ($C \geq C_{min}$) should indicate satisfaction because these individuals are not worse off from collective action (the service). Contrariwise, we would expect an expression of dissatisfaction if $C < C_{min}$ because minimum requirements are not met and there is a negative fiscal residual.

Figure 2 displays the former situation while incorporating some of the process variables and parameters introduced above. The superscript emphasizes the individual nature of these values or parameters. We would expect the ith individual to report satisfaction with the service producing Q to alter social condition C since $C^i > C^i_{min}$.

It has been suggested that a raw race effect may exist in individual evaluations of neighborhood and housing conditions. If a raw race effect does exist in individual evaluations then expressions of dissatisfaction become suspect as a basis for analyzing service outcomes. The caveat raised by this suggestion does not appear to be warranted. There is an increasing number of studies which indicate that such a bias in survey responses is either nonexistent or negligible. Most recently, for example, Casey (1980) concludes:

> Whites and blacks living in similar conditions evaluate structures and neighborhoods which reflect conditions similarly. (Summary of Findings)
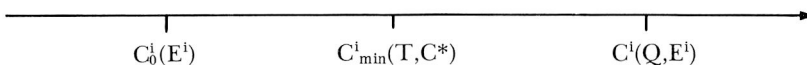
$$C^i_0(E^i) \qquad\qquad C^i_{min}(T,C*) \qquad\qquad C^i(Q,E^i)$$

Figure 2. Social States and Satisfaction

and Marans (1979) observes:

> Taken as a whole, however, the background of the respondents has little effect on how individuals evaluate specific neighborhood attributes (p. 28).

and further, Bielby (1979) notes that:

> . . . within neighborhoods, blacks and renters evaluate the conditions of those neighborhoods more favorably than do similarly situated whites and non-renters (p. 24).
> . . . the effects are small (p. 18)

It can be concluded, therefore, that expressions of satisfaction or dissatisfaction do reflect neighborhood service outcomes. That is, the premise that expressions of satisfaction indicate that $C \geq C_{min}$ is valid.

IV. AN EQUITY NORM BASED ON SATISFACTION

Using expressions of satisfaction as indicators that $C^i \geq C^i_{min}$ (i.e. a nonnegative fiscal residual exists) we may define ex post relative equity to exist in service delivery when everyone is satisfied with a service.[5] Each individual, as an individual, is treated fairly in the sense that the service outcome from collective action (C^i) at least minimally satisfies individual requirements. Final outcomes for individuals are the same in relation to requirements in the sense $C^i \geq C^i_{min}$, all i.[6] Thus the term ex post relative equity is used. It is possible under ex post relative equity for C, C_o and C_{min} to differ absolutely across individuals because of the intervening influences of environmental factors and differences in preferences and tax costs. Ex post relative equity does not imply ex post absolute equity. Ex post absolute equity would imply that C^i is the same for all individuals.[7]

Given differences in preferences for local public services, the limit on local resources to support the provision of services, and the quasi-public nature of some services it is evident that ex post relative equity, though normatively valid, may be too stringent as an equity norm for evaluating service delivery policies. It is not possible to individualize the distribution of local services as if they were priviate goods, and few, if any, communities are sufficiently wealthy to provide the absolute levels of service activities necessary to insure that final social outcomes exceed everyone's minimum requirements. There is a valid resource allocation problem at the local level that must be recognized when evaluating the equity of a service delivery system.

Local governments can, however, satisfy an equal opportunity criterion in service provision that is consistent with the intent of ex post relative equity by designing local service delivery systems so that there is a (more) equal *chance* of securing minimum required service levels, that is, a nonnegative fiscal residual from collective action. Ex ante relative equity is

achievable. In the context of service delivery *ex ante relative equity exists when the probability of achieving a nonnegative fiscal residual from service delivery is invarient across individuals or groups of like individuals.* Empirically we may conclude that ex ante relative equity exists when the probability of being satisfied is invarent across individuals or groups. Given the premise that expressions of satisfaction indicate $C^i \geqslant C^i_{min}$ it follows that: Prob (nonnegative fiscal residual) = Prob ($C^i \geqslant C^i_{min}$) = Prob (Satisfaction).

Ex ante concepts of equity have been accepted in practice when the achievement of ex post equity involves some undesirable consequences which outweigh any costs associated with equality differences between the two equity norms: military draft laws, jury duty and some life saving situations requiring the drawing of lots are examples where an ex ante norm has been applied. In the case of service delivery ex post relative equity may involve an extremely high monetary cost because of differences in preferences and environmental conditions. Its achievement may place an unacceptable financial burden on local tax/revenue capacity. Thus even though ex post relative equity may be preferred it may not be attainable and must be abandoned as an equity norm in favor of ex ante relative equity.

In summary it is perhaps worthwhile to return to Figure 2 and reiterate and reemphasize the differences between ex post absolute equity, ex post relative equity and ex ante relative equity in the context of service outcomes before proceeding to the empirical analysis. Ex post absolute equity focuses attention on C independently of expectations (C_{min}). It exists if final outcomes (C^i) are the same for all individuals. Ex post relative equity focuses attention on outcomes (C^i) *relative to* minimal requirements (C^i_{min}). It exists if $C^i \geqslant C^i_{min}$ for all i. C^i need not equal C^j. Ex ante relative equity focuses attention on the *probability* that $C^i \geqslant C^i_{min}$. It exists if $P(C^i \geqslant C^i_{min})$ is the same for all i, where $P(\cdot)$ denotes probability.

Further if an individual expresses satisfaction with a service when $C^i \geqslant C_{min}$ then the probability that ($C^i \geqslant C^i_{min}$) is equal to the probability that an individual expresses satisfaction. Alternatively, if dissatisfaction is expressed when $C^i < C_{min}$ then the probability that ($C^i < C_{min}$) is equal to the probability that an individual expresses dissatisfaction. As such, survey data reporting individual evaluations of local services can be used to evaluate distributional consequences of local service delivery.

V. EMPIRICAL RESULTS: A CASE STUDY OF SIX SERVICES

Equation (1) represents one form of the empirical model used to evaluate the distributional consequences of service delivery in Wichita, Kansas, using an ex ante relative equity norm.

$$(1) \quad \text{Log} \frac{P_{ij}}{(1 - P_{ij})} = \beta_{0j} + \beta_{1j} (R) + \beta_{2j} (M) + \beta_{3j} (LY) + \beta_{4j} (MY) + \epsilon$$

where P_{ij} = the probability of an individual in the ith socioeconomic group being dissatisfied with the jth service.

$P_{ij}/(1 - P_{ij})$ is the odds of being dissatisfied.

$$R = \begin{array}{l} 1 \text{ Renter} \\ -1 \text{ Otherwise} \end{array}$$

$$M = \begin{array}{l} 1 \text{ Minority (Non-white)} \\ -1 \text{ Otherwise} \end{array}$$

$$LY = \begin{array}{l} 1 \text{ Low income (Income} < \$7500) \\ -1 \text{ Otherwise} \end{array}$$

$$MY = \begin{array}{l} 1 \text{ Middle income } (\$7500 \leq \$15,000) \\ -1 \text{ Otherwise} \end{array}$$

The model is an application of the logistic distribution and the unknown parameters (β_{kj}, k = 0, . . . ,4) are estimated using a stepwise logit procedure.[8] The right-hand dummy variables define socioeconomic groups for evaluating equity in service delivery with the reference group being non-minority, high income ($\geq \$15,000$), homeowners.

If ex ante relative equity exists then any variation in the logrithm of the odds of being dissatisfied around β_{0j}, all j, should be random or unrelated to R, M, LY, MY. The estimated values for β_{kj}, k = 1, . . . ,4 should be statistically insignificant. This would indicate unpatterned inequality relative to the reference group. If the underclass hypothesis is true, narrowly defined as unequal treatment in service delivery to the economically disadvantaged, the odds of being dissatisfied should be higher for low income individuals, that is, $\beta_{3j} > 0$, all j. A priori the sign for β_{4j} is unknown, though a strict interpretation of the underclass hypothesis suggests $\beta_{4j} \geq 0$. Differential treatment on the basis of race only would be reflected in a statistically significant positive estimated value for β_{2j}, all j. This empirical result would imply that the race preference hypothesis explains service delivery. If ($\beta_{kj} > 0$, k = 2,3, all j), we have evidence supporting a broadly specified power-elite hypothesis about service delivery.[9]

The tenure variable, R, is included in the logit models to standardize for possible differences in intraurban mobility between renters and owners which may influence the probability of being dissatisfied with a service. Because of their tenure status it is reasonable to expect that renters are better able to adjust to intraurban variations in service delivery by changing location when compared with owners. Moving costs, on average, are lower for renters and they are often less strongly tied, both psychologically and sociologically, to a particular location. Given their greater mobility and the locational characteristics of many local public services, renters as a class should have greater likelihood of being satisfied with service delivery than owners regardless of income or race. This implies $\beta_{1j} < 0$, all j.

It is also possible that renters face smaller tax burdens than owners because rental property owners are unable to fully shift tax costs forward. This means there is a greater likelihood that actual service outcomes from a given delivery system will exceed minimum required levels for renters compared with owners, independent of any location effects. This is further reason for hypothesizing that $\beta_{1j} < 0$.

The logit model is estimated for six services provided within the city of Wichita: routine services—(i) streets, (ii) shopping, and (iii) transportation services; protective services—(iv) police and (v) fire protection; and developmental services—(vi) education.[10]

In Table 1 are presented the coefficient estimates of the logit models based on data generated from the 1974 Annual Housing Survey sponsored jointly by the Departments of Commerce and Housing and Urban Development. The results describe an *historic pattern* in service delivery since the data reflect levels of dissatisfaction during 1974, the year the data were collected. The analysis forces us to ask, however, if service delivery

TABLE 1
Service Logit Models*
(Stepwise Logit Procedures)

Independent Variable	Transportation	Schools	Shopping	Police	Fire Protection	Streets
Constant	−1.638	−2.789	−1.661	−2.126	−3.695	−1.582
	(0.017)	(0.022)	(0.015)	(0.018)	(0.037)	(0.016)
R	−0.164	−0.116	0.360	−0.147	−0.414	−0.043
(Renter = 1)	(0.008)	(0.016)	(0.009)	(0.012)	(0.022)	(0.009)
M	−0.157	0.606	0.282	0.343	0.074	0.177
(Minority = 1)	(0.017)	(0.020)	(0.014)	(0.018)	(0.035)	(0.016)
LY	−0.138	−0.216	−0.388	0.164	−0.071	0.052
(Low Income = 1)	(0.010)	(0.019)	(0.011)	(0.014)	(0.021)	(0.011)
MY	−0.015	0.140	−0.412	0.168	−0.147	0.096
(Middle Income = 1)	(0.008)	(0.017)	(0.010)	(0.013)	(0.020)	(0.010)

*Dependent variable = log (Odds of Being Dissatisfied)
 Asymptotic standard error in parentheses
 Critical X^2 value = 3.84

systems have changed significantly since this time. If they have not changed, it may be reasonable to presume that the distributional conse- quences of service delivery today are similar to those which existed during the sample period as described in Table 1.

For transportation, schools, police, fire protection and shopping the odds of being dissatisfied are calculated using the estimated relative fre- quency of individuals reporting inadequate or unsatisfactory service. In the case of street services, the estimated relative frequency of individuals reporting "continually in need of repair" is used. As with the relative frequencies, values for the dummy variables defining socioeconomic groups are determined by responses to questions in the Annual Housing Survey questionnaire on income, tenure and race.[11]

The coefficient estimates measure the effects on logits (logarithm of odds) from being a renter rather than an owner, a minority rather than a nonminority, and of low or middle income rather than high income, respectively. Overall the precision of the point estimates is quite high. All of the parameter estimates in all equations are significant at the .05 level, using a (Wald) Chi-square, one-tail test.[12] An alternative test for judging statistical significance is a Chi-square test involving differences in the log of the likelihood function; a likelihood ratio test. This test is analogous to the general F-test in ordinary least squares estimation. Given the stepwise procedure used to estimate the logit models we are assured that each of the included explanatory variables sequentially passes this Chi-square test ($\alpha \leqslant$ .10). On the basis of these test results we may have confidence that know- ledge about tenure, race and income add significant information to each of the service delivery models. We may conclude that patterned inequality in relative service outcomes exists in Wichita since variations in logits are not random with respect to tenure, race or income.

Though each of these factors provides significant information about the distributional consequences of service delivery, examination of the alge- braic sign attached to the coefficients indicates that none of the simple hypothesis outlined above, alone, completely accounts for these conse- quences. It does appear, however, that the race hypothesis is nested in a broader, more comprehensive, explanation of service outcomes.

Specifically, though there is evidence of inequality in relative service outcomes with respect to income, the pattern is not consistent with either the underclass or power-elite hypothesis. Logits *decline* with income for four services: transportation, schools, shopping and fire protection. This implies that low and middle income individuals are *less likely* to be dissatis- fied with these services when compared with high income individuals of the same race and tenure status. The probabilities of being dissatisfied with police and street services increase, however, as incomes decline.

There is support for the race hypothesis as a partial explanation of service delivery in Wichita. Except for transportation services there is a consistent pattern of increasing logits for minorities. Minorities are more likely to be dissatisfied with a service than are nonminorities. Unwinding the expression for odds we can estimate the increase in the probability of

being dissatisfied for minorities compared with nonminorities, holding tenure and income class constant. These differences are summarized in Table 2, by service.

Only in the case of fire protection services could the argument be made that race though a statistically significant factor, results in inconsequential differences in the probability of being dissatisfied. All of the estimated probability differences for fire services are less than one percentage point· most differences are less than .005. For all other services the differences appear to be substantial; most are equal to, or greater than, five percentage points.

The coefficient estimates associated with the tenure variable (see Table 1) are consistent with the notion that renters, because of their greater intraurban mobility, are better able to adjust to distribution patterns in service delivery than are owners. Renters have smaller estimated logits across all services except shopping. That is, they are more likely to be satisfied with services than are homeowners. Admittedly, this is not a particularly strong test of this variant of the "Tiebout hypothesis" (Tiebout, 1956) because renters may, as mentioned above, also face smaller tax burdens than owners and thus have a greater likelihood of being satisfied independent of any location effects. Nonetheless observed differences in satisfaction levels between renters and owners warrant further analysis because they point to some interesting service delivery questions: Do renters adjust location to service delivery systems? Do renters have lower expectations about service outcomes? Do municipalities favor renters in service delivery decisions?

TABLE 2
Calculated Probability Differences for Minorities
Compared with Nonminorities

	Transportation	Shopping	School	Police	Fire	Streets
Owners						
Low Income	(.0439)	.0606	.0713	.0734	.0055	.0500
Middle Income	(.0512)	.0576	.0811	.0738	.0049	.0529
High Income	(.0521)	.0992	.1020	.0568	.0064	.0466
Renters						
Low Income	(.0349)	.0963	.0583	.0584	.0025	.0472
Middle Income	(.0415)	.0937	.0665	.0587	.0023	.0500
High Income	(.0424)	.1319	.0845	.0444	.0030	.0439

Calculated using the parameter estimates from Table 1. and the relation $p = 1/(1 + \exp{-x\beta})$.
( ) = Negative difference

IV. IMPLICATIONS AND FUTURE ANALYSIS

The results summarized above suggest that pervasive patterned inequality in relative service outcomes as measured by dissatisfaction existed with respect to race within Wichita, Kansas, during 1974. This conclusion is based on observed differences in the probability of being satisfied with six primary local services: transportation, shopping, schools, police, fire protection and street services. The distributional consequences of current service delivery practices requires analysis of more current information, obviously. Such an evaluation, and analysis of any changes in distributional consequences over time, will be possible when data from the re-survey of Wichita residents are made available.

Nonetheless, such a pattern of inequality as existed in 1974 suggests that past service delivery decisions did not adequately consider the expectations or aspirations of the minority population and requires us to ask, without answer, whether service delivery processes have significantly changed since then. Have city officials and agencies become more sensitive to the needs of the minority population? Indirect evidence suggests that corrections in service delivery are still needed. Relations between the minority population within Wichita and local government are suspect, as evidenced by recent and persistent confrontations between segments of the minority population and various local agencies. There is a perception among many individuals that the needs of the minority population are not being adequately addressed by local public services.

With respect to future analysis the results also raise the question whether the distributional consequences of service delivery observed in Wichita differ significantly from those in other cities during the same time period. If so, what factors account for these differences? Obvious candidates for consideration include geographic size of the jurisdiction (scale economies), the relative size of the minority population (a tipping phenomenon), wealth of the community (resource constraint) and political structure (responsiveness). These factors, among others, will be considered in an intercity analysis of data drawn from central cities surveyed in the Annual Housing Survey during 1974, 1975, and 1976.

FOOTNOTES

[1]The distinction between ex post equity and ex ante equity can be explained through example by considering the selection of jurors. Ex post equity exists if every eligible person serves (per period of time, e.g. each year) while ex ante equity exists if the probability of being selected for jury duty is the same for every eligible person. Under ex ante equity the final outcome (serving as a juror) is not the same for every person; the probability of the outcome is the same, however, for every person. The two equity concepts would be equivalent if the probability of occurrence were zero or one; does not serve as a juror $(P = 0.0)$ or serves as a juror $(P = 1.0)$. The concepts of ex ante and ex post equity are developed in Pauley and Willett (1976). This point is discussed in greater detail in Section IV, also.

[2]Given $C = C(Q, E)$ an individual's preference function may be written as $U = U[C(Q, E) Y]$ where Y is income. The comparison an individual makes when deciding to agree or disagree with collective action is:

   a. if $U[C^1(Q^1, E), Y^0 - T] \geq U[C^0(Q, E), Y^0]$, agree

   b. if not, disagree

where T is the tax payment imposed on the individual to support collective action, C^0 and Q^0 represent initial values, and C^1 and Q^1 represent expected values after collective action. $Q^0 = 0$ if the service is not being provided initially while $Q^0 > 0$ if the question is to expand service. Condition "a" implies an individual will agree to collective action if the fiscal residual is zero, that is, the individual is not made worse off. Strictly, speaking,

therefore, an individual will agree to collective action if the fiscal residual is nonnegative.

[3]For an individual in a single-service jurisdiction C_{min} is identified graphically in Figure A by the area C^0 $abC_{min} = T$, where MB is the relevant marginal benefit curve.

Figure A
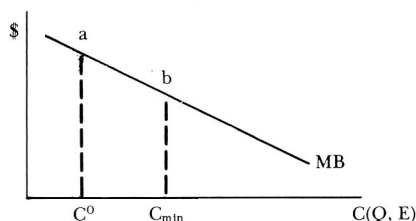
The multiservice case is represented in Figure B with the superscripts identifying both services and social states, given the assumption that Q and C are service specific.

Figure B

$$C^{0j}abC^j_{min} + C^{0k}deC^k_{min} = T$$
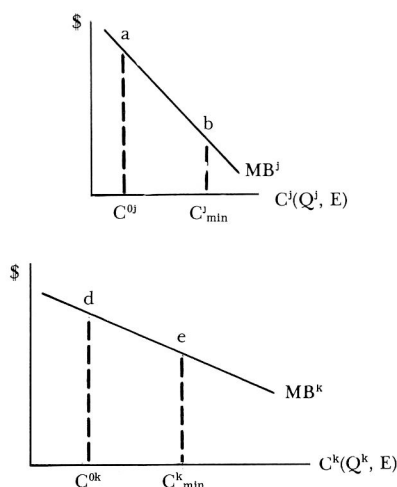
$$C^j_{min}b/\$ = C^k_{min}e/\$$$

[4]The effect of relative service deprivation can be captured in the preference function by including the term C/C^* where C^* is set to reflect some community norm, the most favorable state for C in the community, for example. Then,

$$U = U(C, C/C^*, Y, T)$$

[5]Citizen evaluations have been used extensively in evaluation for local service delivery and public policy (Taylor, 1974; Lovrich and Taylor, 1976; Angrist et. al., 1979). For a critique of the use of citizen evaluation see Stipak (1979). None of the former studies has attempted to explicitly analyze distributional consequences using citizen evaluations. This study demonstrates the potential usefullness of citizen evaluations in analyzing the impact of service delivery.

[6]This corresponds to the concept of equal satisfaction of demand discussed by Savas (1978).

[7]In one sense ex post relative equity is a weaker norm than ex post absolute equity because C^i is allowed to vary across individuals. From another perspective, however, it can be argued that ex post relative equity is stronger because under a uniform distribution of C (all C^i the same) it is possible for fiscal residuals to be positive or negative, depending on preferences and tax burdens.

[8]See Amemiya (1981), Stopher and Mayburg (1979), Hanushek and Jackson (1977) and Theil (1970). Logit analysis is used because the results are readily translated into probability statements and the logit model captures interaction effects. Though the logit model is linear in the explanatory variables the underlying probability relation is nonlinear: $P = 1/\left[1 + \exp\text{-}(X\beta)\right]$ and $\partial P/\partial X_1 = \beta_i P(1 - P)$. The empirical model therefore captures interaction effects on probabilities between income, tenure and minority classification. Though logit analysis typically involves categorical variable coded (0,1) the specific algorithm used for estimation creates design variables taking on values $1, -1$ respectively. These values are indicated above because they are used to calculate probabilities reported in later sections.

[9]For a discussion summarizing and generalizing the under-class hypothesis see Lineberry (1975). The narrow under-class hypothesis, the race hypothesis and the power-elite hypothesis are special cases of a generalized under-class hypothesis.

[10]For a concise discussion of the local service delivery systems and agencies serving the city of Wichita see *Center for Urban Studies* (1979). Wichita is the only First Class city (population > 15,000) in Sedgwick County and has a population of 265,000 (1978). Education services within the city are provided by a single unified school district (USD # 259).

[11]See U.S. Department of Commerce (1976), Appendix A, pp 16-25.

[12]For a discussion of hypothesis testing in the context of discrete models see Amemiya (1981, 1497-1498). Because the test statistics are based on asymptotic properties Wald's Chi-square test is equivalent to a test based on normality which in turn, can be reasonably approximated by a t-test.

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