NBER WORKING PAPER SERIES

THE EFFICIENT LEVEL OF PUBLIC LIBRARY SERVICES

Malcolm Getz

Working Paper No. 321

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

February 1979

This study was supported by grants from the Book of the Month Club and the Scherman Foundation to the NBER. The author is solely responsible for the views expressed.

NBER Working Paper 321
February 1979

ABSTRACT

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Criteria for determining the efficient mix of branches, hours, stock, and new acquisitions are developed and applied to the branch operations of the New York Public Library. A method based on travelling costs is used to value library use at each branch. The relationship between library operations and library use is estimated using a two-stage technique. The costs of library operations are explored. Marginal benefit-cost ratios are presented. The study finds that the New York Public Library operates too many branches for too few hours of service.

Malcolm Getz
Box 6221 B
Vanderbilt University
Nashville, Tennessee 37235

(615) 322-2872

THE EFFICIENT LEVEL OF PUBLIC LIBRARY SERVICES

Malcolm Getz[1]

In the era of fiscal austerity and Proposition 13 fever, the issue of determining the efficient level of local government services is particularly acute. Public libraries are more vulnerable to cutbacks than other services because library closings do not represent the immediate threat to public health or safety which fire, police, and sanitation cutbacks imply.

In fact, public library budgets are subject to wide swings. For example, the Buffalo-Erie County Public Library suffered a 27-percent cutback in budget in 1977; 11 percent was restored in 1978. Such erratic budget changes tend to destroy the morale of library employees, disrupt orderly management, and disturb public habits of library use. Because library use and public sentiment toward libraries are not subject to such severe short-term swings, it would seem that budget officers make changes with little evidence to guide them. They may be experimenting to discover the effect of different budget levels.

Formal methods for evaluating the efficiency of different levels of operation might lead to greater budget stability by making specific requests for change more defensible. Of course, formal methods involve aggregation, abstraction, and wrestling with difficult problems of valuation; and they do not replace informed judgment. However, a formal approach to budget evaluation can pinpoint the area

in which judgment must be applied and thus help avoid the destructive pattern of budget instability which characterizes many public libraries.

Formal analysis can also provide insight into the efficient mixture of library expenditures. Perhaps more benefits can be derived per dollar of expenditure by changing the mixture. Rather than choosing between spending more and spending less, public library managers can use formal budget evaluation to spend more wisely.

In the discussion which follows, previous studies of library services are reviewed to establish the state of the art in evaluating libraries. The problem of determining the efficient number of branches is then discussed, using evidence from the branches of the New York Public Library. Efficient levels of hours and book stock are addressed, again using data from the New York Public Library. Finally, a possible reallocation of expenditure with fewer branches operating longer hours is evaluated.

STUDYING EFFICIENCY IN LIBRARIES

Efficiency is used here to mean deriving as much benefit as possible from expenditures. Benefits are consumer valuations of services, and expenditures include the full social costs of activities. In competitive private markets, prices carry information about social costs and allow consumers to judge the level of service that makes them best off. Producers use revenues from sales as signals of how much to produce. However, when goods are provided collectively, as with public libraries, other means must be used to determine the efficient level of activity.

The decision rule for a pattern of expenditure that will make consumers best off is simply stated: the additional benefit from one dollar of expenditure should be just one dollar. If the additional benefit were greater than one dollar, then the total benefit, net of costs, would increase with the additional expenditure, and the additional expenditure would be justified. If the additional benefit were less than one dollar, then reducing expenditures by one dollar would reduce costs more than benefits; thus benefits, net of costs, would be increased by cutting back. Of course, in order to operate the enterprise at all, total benefits must exceed total costs. But in most situations, the problem of choosing the most efficient level of operation--the level that makes consumers best off--is the problem of identifying the level of service where the extra benefit of additional expenditure matches the cost.

The linkage between library expenditures and consumer benefits must be carefully defined and measured. First, how do expenditures generate services (the cost function)? Second, how much use is generated by the services (the production function)? Third, how do consumers value the different kinds of use (the valuation problem)? Other authors have considered the problem of evaluating library services. Their efforts are reviewed briefly here as background for the investigation to follow.

Several economists have applied benefit-cost analysis to library services. Newhouse and Alexander [13] focused on book selection in the Beverly Hills, California public library. They assumed that use of library materials represents some fraction of the value of ownership

of the materials. Consequently, they suggested that the value of use of library materials is directly related to the purchase price of the materials (art books are more valuable than juvenile books, for example) and that value is directly related to the amount of use. By assuming that the same proportion of users would be likely to buy each type of book if the library copies are unavailable, Newhouse and Alexander estimated a valuation for each category of book and compared the values to the costs of the books. As a result of this analysis they recommended that the Beverly Hills Library buy more expensive and fewer inexpensive books.

The Newhouse and Alexander study is valuable because it deals directly with the problem of valuation, but the study has several limitations. Because they were uncertain how many users would buy books if the library copies were unavailable, the authors were unwilling to state the value of library use; they limited their conclusions to defining the best mixture of book purchases, given the book budget. Of course, the book budget is only one part of the design of a library. Newhouse and Alexander did not deal with the geographic character of public library services--namely, the number of branches--nor did they consider the issue of hours of service.

Hu, Booms, and Kaltrieder [10] used benefit-cost methods to compare mail-order and bookmobile services in rural Pennsylvania. The average cost of the bookmobile service was $0.62 per circulation, while the average cost of the mail-order service was $0.69 per circulation. The mail-order service was more expensive because of the cost of preparing and mailing catalogs for selection. Estimated cost functions revealed

that the operating cost per book circulated by the bookmobile service was $0.48; the operating cost of the mail service was $0.60.

The authors considered five different methods for establishing the benefits of the rural library services. First, they determined how much time was saved by users ordering books for delivery instead of making trips to the library. Second, they estimated the additional amount of money that users would have spent buying books if library service were less convenient. Third, the authors asked users what they would be willing to pay for the service. And fourth, they determined at what price books might be rented, if rentals were available. In addition, the authors considered the value of the option to use the service by people who do not use it, that is, the options demand for service. Because asking what users would pay is an unreliable method and because no rental services were in fact available in rural Pennsylvania, the analysts summed the time saved, the value of books not purchased, and the value of the options demand for service to establish the benefit for each service. They calculated the marginal benefit of rural delivery at $.29 for the bookmobile and $.47 for mail delivery. Thus, while mail delivery yields more benefits per dollar of expenditure than the bookmobile service, the benefits of neither system cover operating costs. The authors concluded that consumers in rural Pennsylvania are better off with the tax saving of visiting the library than with elaborate delivery systems. The Hu, Booms, and Kaltrieder study is noteworthy because it employs surveys of users and nonusers in developing estimates of benefits. Of course,

the study of rural delivery is only tangentially relevant to the design of an urban system.

Other economists [7, 17] estimate cost functions of quasi-production functions without trying to establish values for benefits, but they do not claim to identify efficient levels of service. In the best of these studies, Feldstein [6] estimated cost and circulation functions in 371 cities using a 1968 Office of Education survey of public libraries. In estimating a use of relationship, Feldstein recognized that the library activities, branches, hours, and book stock might be shaped by library managers in light of patterns of use. Thus, the simple correlation between use and service level reflects both consumer behavior and managerial choice. While Feldstein used an instrumental variable technique to try to control for the simultaneity, it is not clear what variables were used as instruments. The use of city library systems as units of observation also caused some trouble because no distinction was made between a system with a large central library and small branches and one with a smaller central library and larger branches. Consequently, Feldstein could not develop statistical results to validate the claim that "fewer large branches is preferred to more small branches." Feldstein found that library use is sensitive to the level of service and that expenditures are shaped by local demographics and local government revenue services.

In an earlier study of library economics, Black [3] examined expenditure and use in a dynamic context. He recognized that library

use would change with changes in population level, income, and wages. Assuming that the efficient level and mixture of services would be determined in response to use in this demographic context, Black emphasized the fact that efficient library service would change with time. Baumol and Marcus [1] considered the changing costs of academic library services, but did not provide an analytic framework. The fact that library costs are rising faster than other costs is not in itself a clue to determining efficiency.

Operations research analysts have studied libraries in some detail. Although Hamburg, Clelland, Bommer, Ramist and Whitfield [8] have surveyed a substantial amount of this literature, they have contributed little to the problem of estimating the valuation that consumers place on library activities. They note that the average rate of return in the private sector is 12.5 percent. "By assuming that the average public library has benefits that exceed costs by 12.5 percent, we estimate the dollar value imputed to an exposure hour" [8, p. 33].

Operations research analysis appears to offer a better understanding of the production function than the more aggregate methods generally used by economists. In the best example of such work, Morse [2] analyzed the operation of the MIT library. He used queuing theory to determine the optimum number of multiple copies and a markov process to predict book use. Morse also considered the optimum length of loan period and the optimum number of reserves. These techniques are readily applicable in many library situations and deserve wide use. However, because Morse studied an academic library and emphasized operation issues, his

approach offers little guidance in making budgetary choices for public library systems.

Raffel and Shishko [15] also used operations research in a study of the MIT library. The authors asked 283 students and faculty members to allocate a budget over 20 service changes. According to the responses, the authors distinguished two groups of users. The first (mainly students) preferred outside use: more duplicate copies for loan and longer loan periods. The other group (generally users engaged in research) favored increased acquisition, a messenger service with the Library of Congress, and department libraries. Using answers to hypothetical questions by relatively uninformed users may not be a reliable analytic technique. Nevertheless, the Raffel and Shishko study represents a creative effort to investigate the valuation of services in the context of an academic library, where the valuation problem is especially difficult.

Librarians, of course, have also been interested in evaluating library services. Lancaster's [11] comprehensive survey illustrates the strengths and the weaknesses of studies by librarians. Their main strengths are close attention to detail and sensitivity to nuances of service quality. For example, a study conducted by Crowley and Childers [4] assessed the quality of available reference services by asking a set of topical questions during anonymous telephone calls made at random times to public libraries in New Jersey. The authors found that the libraries generally did a poor job of responding to questions which required very current information (recent Presidential cabinet appointments, for example). It is easy

to see how such surveys might be used by libraries to monitor their own telephone reference services and even to make judgments about the effectiveness of different training methods and work assignments. Another study by Seymour and Schofield [16] reported on the use of card catalogs. "Failures" were classified as follows: (1) item in catalog but not found; (2) item in library but not cataloged; (3) item on order; (4) identified item not in collection; and (5) unidentified citation. Clearly, an analysis of the first group of failures might lead to revision of catalog headings (if inexpensive); failures in the fourth category might give a clue to collections development. These detailed performance studies reflect the librarian's concern with the quality of individual library activities.

Another attempt by librarians to develop performance indicators casts a broader net. DeProspo, Altman, and Beasley [5], under the auspices of the Public Library Association, propose a more comprehensive data-gathering effort using sampling techniques to describe the user success rate in finding materials (the probability of finding particular items from standard bibliographies in the catalog and on the shelves). A study of the scope proposed by the authors would include consideration of facilities use, reference, outreach, circulation, materials available, users, and in-library activity. The specific purpose of the proposed methods is to develop a broad base of information useful to library management, and, clearly, the use of sampling techniques represents a substantial improvement over current practice.

The main deficiency of most evaluations by librarians is the lack of concern with costs. Lancaster gives little information about bench marks for the costs of different kinds of library activity, nor does he suggest how costs might usefully be measured. Even the comprehensive approach proposed by DeProspo, et al. is aimed at improving performance measures and gives short shrift to costs. Efficiency, however, cannot be defined without reference to costs.

The lack of concern with costs leads librarians into several traps. First, they like to talk about the number of people unserved by libraries. Usually, this seems to mean the residents of jurisdictions which have not chosen to build public libraries. But DeProspo, et al. broaden the reference: "Iowa and Minnesota show the percentage of population unserved by libraries, although it is not clear if the figures relate to the lack of a library in a given area or, more important, that a percentage of the population does not avail itself of library service" [5, p. 23]. The implication seems to be that, whatever the cost and whatever consumers' preferences, more should be spent on libraries until everyone uses them. Lancaster, only slightly more conservatively, cites the view that libraries should strive to satisfy 90 percent of the population's needs [11, p. 166]. The notion that the benefits of library services must be balanced against their costs is not reflected in the concept of an unserved population. Moreoever, this concept rejects consumer preference as a criterion for judging service levels.

A second trap created by the lack of concern with costs is the application of standards. The Public Library Association

promulgated standards for public libraries in 1966 [14], specifying space, book stock, staffing, training, and so on. The description of a successful public library may be helpful. But the standards seem to suggest that communities which do not choose to buy elaborate library services are not acting responsibly. That some communities have difficulty raising taxes and do not value library services highly while others want to pay for high levels of service is easily understandable when efficiency is recognized to account for both benefits and costs and consumer preferences are used as the criteria for judging service. As costs, productivity, and tastes change, the level and mixture of library services different communities desire also change. The efficient set of public library activities has changed since 1966 and will continue to change. Since standards are fixed and unresponsive to change, they are not very helpful in evaluating the efficiency of library services.

Finally, a study of efficiency--that is, how benefits relate to costs--should focus on the cost of major library activities. For example, perhaps the most fundamental cost consideration in an urban public library system is how many branches of what size to operate; the second most important issue is how many hours to operate; the third is how many new books to add each year; and the fourth is the size of the central library. These are the major decisions that determine the size of a public library budget and to a substantial degree, the quality of service. Therefore, these items should be the principal target of evaluation. If the Lancaster survey is any indication, librarians appear to prefer to evaluate

catalog use, reference service, information retrieval, and book collection. Lancaster's discussion of the evaluation of library services hardly mentions the number of branches, hours of service, or numbers of books, except to say that more is better.

In the analysis described below, cross-sectional evidence from the branch libraries of the New York Public Library is used to determine the efficient number of branches, books, and hours of service. Analysis of the efficient size of the central library services requires a different methodology because the central facilities in library systems are unique within each system. The present exercise is limited to a cross-sectional study focusing on neighborhood branches. The New York Public Library has been chosen for evaluation because its large number of branches facilitates a statistical analysis.

HOW MANY BRANCHES?

The first priority in judging the efficiency of an urban library system is determining the efficient number of branches. The evaluation paradigm is straightforward: the benefits and costs of each branch are measured and compared. Each branch is considered in turn as the marginal branch. The actual use of each branch is valued from the consumer's point of view. Because the estimates of costs and benefits are approximations, choices are made so as to give low estimates of costs and high estimates of benefits within the range of plausible values.

The New York Public Library, a private, nonprofit, research library, operates branch libraries under contract from the City of New York in three boroughs: Manhattan, the Bronx, and Staten Island (Richmond County). Because the facilities of the research libraries are generally used on premise, their services are not close substitutes for the traditional public library services of the branches, and so they are ignored here. The branch libraries include a facility for the handicapped that provides services throughout the City and beyond. The service to handicapped persons is also not a close substitute for the traditional library services, so it too is excluded from the analysis.

The branches are classified as centers, regional libraries, and neighborhood libraries. The centers are the largest facilities; there is one in each borough, plus one for the whole system. The centers have an average book stock of over 120,000 volumes. The 13 regional libraries have an average stock of 33,000 volumes. There are 59 neighborhood libraries in the system; each has a permanent book stock, an average of 24,000 volumes, and staff. Two former neighborhood libraries which are operated at a marginal level without a permanent book stock or staff are not included in this analysis.

In all, the branch libraries operate 76 regular, general-purpose facilities with permanent book stocks and staff. They serve an area of 122 square miles which in 1970 had a population of 3.3 million. Summary information for an average branch of each type and totals for all 76 facilities are reported in Table 1. The three types of branches seem to differ in terms other than the size of the

TABLE 1
Branches of the New York Public Library

Item	Average for Type			Total for System
	Neighborhood	Regional	Center	
Stock	23,947	33,535	121,166	2,333,282
Additions	2,685	3,743	19,288	284,213
Professional Staff	2.18	3.42	20.50	255
Other Staff	3.89	5.46	23.88	396
Hours of Service (annual)	1,002	1,389	2,733	88,082
Square Feet	9,442	16,335	50,698	972,257
Adult Circulation	54,357	84,724	456,364	6,133,933
Juvenile Circulation	22,470	33,073	44,079	1,931,960
Adult Reference	14,222	24,316	425,123	2,855,697
Juvenile Reference	7,749	9,969	29,017	702,840
Total Use[a]	112,856	173,638	1,046,163	13,100,480
Cost[b]	$200,108	$337,920	$2,041,436	$24,365,108
Use/Stock	4.55	5.10	10.255	4.94
Circulation/Stock	3.21	3.51	4.13	3.46
Cost/Use	2.45	2.59	1.72	2.43
Percent of Circulation--juvenile	29	28	09	24
Percent of Stock--added	11	11	16	12
Percent of Staff--professional	34	39	44	39
Number of Locations	59	13	4	76

Source: The New York Public Library, 1976-77 flows, 1977 stocks.

[a]Total Use is reference questions plus 1.183 times circulation. The 1.183 factor is to account for in-library use. It is an average figure from a survey of library users in a sample of 15 neighborhood branches in the New York Public Library.

[b]Cost is based on the operating budget for each library. Reported budget figures anticipated for 1976-77 are adjusted for part-time staff shifts among branches as reported in library budget documents. In addition,

TABLE 1--continued

Comprehensive Employment and Training Act Employees are added in at $9,000 each. Operating costs are inflated by 20 percent to reflect the administrative overhead costs of the system. Rent payments actually paid are excluded from costs, but $5 per square foot are included for each facility reflecting an approximation to the annual lease value of space. Actual rentals varied from under $3 to over $9 per square foot for the small number of facilities actually rented.

book stock. The centers have larger staffs and operate more hours than the regional libraries, and the regionals operate with larger staffs and are open more hours than the neighborhood facilities. They also differ in respect to the proportion of professional staff, with the larger units having more professional staff than the smaller ones. Note, however, that the regional branches are much more like neighborhood branches than like centers.

The patterns of use of the three types of branches also differ. The amount of use per volume in stock is much larger for the library centers than for the regional libraries and somewhat larger for the regional than for the neighborhood libraries, whether use is defined simply as circulation or as the sum of reference questions and weighted for in-library use circulation. Consequently, the cost per use is lowest at the centers, and is somewhat lower at the neighborhood than at the regional facilities. The greater intensity of use probably reflects the fact that the larger facilities operate longer hours, have larger and more varied collections, add more books to their stocks, and have a more professional staff. On the other hand, the neighborhood libraries circulate a larger share of juvenile materials than the library centers. Surprisingly, however, juvenile materials are about as important at regional libraries as at neighborhood locations. The proximity of the neighborhood branches does not seem to dominate the regional facilities for juvenile use. Note that with 76 locations serving 122 square miles, the average branch serves 1.6 square miles. A circle with a radius of .71 miles subtends such an area.

Cost of Branches

The first step in defining efficiency is an analysis of costs. The budgeted costs of the New York Public Library branch library system for 1976-77 are used here. The operating costs for each facility include staff costs with fringe benefits and supplies; the budget for the acquisition of new materials inflated by 34 percent to account for system processing costs; and plant security and maintenance costs. The operating costs are modified in several ways to reflect actual social costs. First, the staff work part-time in other branches. An approximate net value for such reassignments is used to adjust the budget figures. Also, Comprehensive Employment and Training Act supported employees are added in at $9,000 each. Second, operating costs for each facility do not include the administrative overhead costs for borough and system offices: 20 percent is added to approximate such costs. Third, the budget includes rent expenditure for 15 facilities that are rented. In order to make the cost figures used in this study reflect the full social opportunity cost of the system, an annual lease value is assumed for each facility. Therefore a $5 per square foot lease charge is included in the total costs. For this reason, the social cost figures used here exceed the budget for the library system by about $4 million. The cost figures used here then are an attempt to estimate the full social costs of each facility including the local budget, federal support, and the value of facilities owned by the Library.

The costs of each facility can be related to the level of operation. The operations are summarized in three variables: annual

hours of service, the total stock of materials both book and non-book, and the number of gross additions of stock during the year. The possibility that high levels of use raise costs given hours and books is ignored. The analysis reported in Table 2 indicates the marginal cost of an additional hour of service annually is approximately $2,317, that is $44.56 for a single hour.[2] Maintaining an additional item in stock for a year is estimated to cost $3.93.[3] The acquisition of a new item has an estimated marginal cost of $7.31 including average processing costs.[4] While over half of the variation in costs across neighborhood branches is accounted for by the three operations variables, it is a little disappointing that more of the cost differences are not explained. This weakness may be due in part to the fact that the budget and actual operations may not be for exactly the same time period, and expenditures may be somewhat different than budgets.

Benefits of Branches

The second step in the evaluation of branch activities is the evaluation of the use of the libraries. Library use is recorded in more detail by the New York Public Library than by many libraries. The circulation of books and other materials outside each branch is recorded separately for adult and juvenile materials. In addition the Library makes an effort to count the reference questions asked during several sample periods each year. Thus, the total number of reference questions asked can be estimated. The only major category of use that the Library does not routinely monitor is attendance;

TABLE 2
A Regression Analysis of Costs
59 Neighborhood Branches of the New York Public Library

Item	Coefficient
Constant	41,427.2** (1.763)
Hours	2,317.12* (1.639)
Stock	3.932*** (4.300)
Additions	7.414*** (2.801)
R-squared	.529
F(3,55)	20.626

Ordinary Least Squares Regression. The dependent variable is budgeted costs for 1976-77 adjusted for staff reassignments and Comprehensive Employment and Training Act Employees. The operating costs excluding rents of each branch are inflated by 20 percent to account for system administration. $5 per square foot of space is added to account the social opportunity cost of the space. Numbers in parentheses are t-statistics. Statistical significance is indicated as follows: * .10 level; ** .05 level; *** .01 level all with one-tailed tests.

thus, the in-library use of materials is not systematically known. The Library has undertaken a sample survey of users of 27 facilities in the system. Among users at 15 neighborhood branches, 15.5 percent indicate they planned to use materials in the library. Defining total materials use as circulation times 1.183 puts 15.5 percent of materials use in the library and 84.5 percent outside the library. The in-library use for the sample libraries varied substantially from .05 to .31 of circulation, so sample figures on attendance at every branch would improve the measurement of library use. Total use for this study is the sum of reference questions plus 1.183 times observed circulation.

The critical problem in making a judgment about efficiency is the valuation of use. We want to know what library use is worth to consumers. The prices of goods and services purchased in ordinary markets carry important information about the valuation consumers place on their purchases. If markets work appropriately, the prices will provide just the information a planner would want in deciding just how much of a service to supply. When charges are not made for a particular service, alternative methods must be used to decide what value consumers place on the services they consume. One way to establish such a value for library service is to identify the consumer's next best alternative and determine its cost to the consumer. The cost of the next best alternative is an approximation to the value of the service actually used.

The next best alternative to an individual branch library is the next nearest branch library. If a single branch were closed,

current users would either discontinue library use (perhaps buying more books or doing less reading) or visit the next most convenient branch library. For the user who would visit another library, the value of having a library nearby is simply the differential in travel time and cost of visiting a more distant library over visiting one nearby. As a rough average, the additional travel time and cost will be about the same as the cost of travel from the nearest library to the next nearest. For the user who would stop using the library if the nearest branch were to close, the value of library service must be less than the cost of visiting the next nearest library. At a maximum, the value of the nearest library branch is the cost in time and money of travelling to the next nearest facility. Whether library use continues at another facility or ceases, the cost of travel to the next nearest facility is an upper bound estimate of the value of its services.

The method of valuing library use by looking at the cost of the next best alternative defines a value for an individual branch considered by itself. It does not reveal the value of the full library system. If a single branch closes, some users will be diverted to other branches, and so the use of other facilities will change. In addition, the next nearest branch for some facilities may change when one facility is closed. Thus the proposed method for valuing the library services is appropriate for valuing branches individually.

The value of use of a particular branch is then assumed to be the cost of travelling between that location and the next nearest

facility. Two uses are assumed to occur on each round trip. To calculate the travel time, straight-line distances are measured, and travel is assumed to take place at five miles per hour. Travel time is assumed to be valued at $4 per hour. This implies a valuation of each library use of $0.80 for each mile from a particular branch to the next nearest branch. In addition, $0.50 additional transit fare is assumed each way of the round trip to the next nearest branch. For regional branches, the distance to the library centers is used. For the three borough centers, the Mid-Manhattan Library Center is taken as the alternative. No effort is made to value the services of the MidManhattan Center.

According to this method of valuation, branches with greater use and those located at a greater distance from regional libraries provide more benefits than the branches that are used less and those located near to other branches.

The valuation technique obviously does not give any clue as to the relative value of juvenile versus adult circulation, or of circulation versus reference versus in-library use. In order to account for the possibility that different uses will be valued differently, a second benefit calculation is made. Adult circulation is treated as before, whereas juvenile circulation is assumed to be worth 50 percent more than adult in light of the greater difficulty juveniles may have in travelling to another library. Reference questions are valued at half an adult circulation rate because many questions can be answered by telephone. In-library use is treated like circulation just as before.

The estimated benefits and costs of the branches of the New York Public Library are reported in Table 3. Of the 59 neighborhood branches, 12 are estimated to have benefits greater than costs while 47 have benefits less than costs. Of the 12 with positive net benefits, 6 are in Staten Island, 5 are in the Bronx, and only one is in Manhattan. Of the 47 neighborhood branches with negative net benefits, 26 have benefits that are $100,000 less than costs. Of these 26 branches, 22 are within one mile of the next nearest branch, including 7 that are within a half mile of the next nearest branch. Thus the close proximity of branches seems to be important in explaining the low level of benefits of many branches. A second factor, of course, is low levels of use.

Among the 13 regional libraries, 5 show negative net benefits according to these estimates. Of these 5, the Francis X. Martin Regional Library and the Grand Concourse Regional Library show benefits less than costs of more than $100,000. Martin and Grand Concourse are about a mile apart and the Martin Regional is within a mile of the Fordham Library Center. These facts may explain the low level of benefits indicated for these regional branches.

The Fordham and St. Georges Library Centers show benefits substantially greater than costs. The valuation method does not allow an estimate of the benefit of the MidManhattan Library, the largest library in the branch system. The Donnell Library Center shows negative net benefits in part because it is within a mile of the MidManhattan. The Donnell Library Center may have specialized collections for Young Adults, however, and so the MidManhattan may

TABLE 3
Costs and Benefits of Libraries

Neighborhood Libraries	Use	Benefits	Costs	Benefits-Costs	Weighted Benefits-Costs
Allerton	149,213	172,974	284,216	-111,242	-117,008
Baychester	320,393	444,526	361,976	82,550	89,938
Castle Hill	49,140	57,277	169,584	-112,307	-105,454
City Island	35,865	95,229	79,164	16,066	19,218
Clason's Point	105,979	133,603	252,800	-119,197	-107,885
Eastchester	74,739	89,483	127,316	-37,833	-37,842
Edenwald	112,016	183,249	196,890	-13,641	-3,138
High Bridge	78,991	84,559	199,228	-114,668	-105,291
Jerome Park	81,070	81,646	181,914	-100,268	-90,487
Kingsbridge	154,784	148,035	286,039	-138,004	-133,877
Melrose	66,452	87,986	199,903	-111,917	-98,110
Morrisania	56,223	74,442	231,827	-157,384	-151,526
Mosholu	184,716	245,041	231,476	13,565	12,814
Mott Haven	58,022	86,019	264,710	-178,691	-171,683
Parkchester	204,027	224,919	215,810	9,109	17,216
Pelham Bay	189,608	275,159	220,646	54,513	29,988
Riverdale	124,375	199,684	243,474	-43,790	-41,521
Sedgwick	33,838	32,999	86,198	-53,199	-46,494
Soundview	102,355	120,210	213,086	-92,876	-90,997
Spuytenduyvil	162,451	155,368	217,758	-62,390	-55,963
Throgs Neck	111,748	204,912	214,446	-9,534	15,674
Tremont	34,213	36,622	174,123	-137,501	-132,230
Van Cortlandt	80,717	98,482	119,283	-20,801	-18,776
Van Nest	146,242	175,463	206,396	-30,933	-27,793
Wakefield	94,744	115,597	264,969	-149,372	-154,721
West Farms	40,603	53,761	240,609	-186,848	-189,956
Woodlawn Height	58,995	71,980	104,186	-32,206	-29,996
Woodstock	33,950	29,876	244,044	-214,168	-213,702
Aguilar	65,278	70,500	225,230	-154,730	-149,257
Cathedral	87,942	68,159	112,950	-44,791	-49,648
Chatham Sq.	260,821	203,441	275,499	-72,058	-46,496
Columbia	73,503	69,092	80,618	-11,525	-15,444
Columbus	42,130	50,556	163,982	-113,426	-114,233
Epiphany	263,446	222,348	282,484	-60,136	-61,833
58th Street	201,013	160,810	211,180	-50,370	-60,863
George Bruce	59,521	64,283	240,382	-176,099	-172,076
Ham Fish Park	68,141	61,327	200,422	-139,095	-137,866
Hamilton Grange	101,474	101,474	243,243	-141,768	-137,171
Harlem	27,598	23,403	151,338	-127,935	-128,995
Hudson Park	60,161	51,016	194,551	-143,534	-140,659
Kips Bay	175,492	143,903	229,370	-85,467	-84,808
Macombs Bridge	18,514	16,293	35,579	-19,286	-17,163
Muhlenberg	119,197	125,395	204,631	-79,236	-87,120

TABLE 3--continued

Neighborhood Libraries	Use	Benefits	Costs	Benefits-Costs	Weighted Benefits-Costs
115th Street	26,836	24,689	170,450	-145,761	-143,394
125th Street	27,511	23,439	209,441	-186,001	-186,611
Ottendorfer	91,007	75,062	176,954	-101,891	-103,650
Riverside	322,040	305,938	262,354	43,584	24,584
Seward Park	167,016	130,272	337,560	-207,288	-201,171
67th Street	102,051	97,969	211,648	-113,679	-115,784
Washington Height	59,419	52,289	204,761	-152,472	-148,119
Webster	68,236	58,683	127,117	-68,434	-68,568
Yorkville	334,593	287,750	314,101	-26,351	-34,039
Dongan Hills	142,321	319,704	187,044	132,660	152,803
Great Kills	230,284	785,416	214,049	571,367	618,979
Port Richmond	127,721	205,123	192,477	12,646	8,980
Stapleton	64,964	108,116	126,786	-18,670	-14,898
Todt Hill	153,014	349,068	152,388	196,680	241,868
Tottenville	47,455	348,321	89,545	258,776	291,905
West New Brighton	124,362	199,725	146,193	53,532	50,612
Regional Libraries					
Bloomingdale	342,940	857,349	408,709	448,640	428,426
Countee Cullen	64,893	246,937	411,437	-164,500	-187,589
Ft. Washington	142,199	810,533	325,543	484,990	460,702
Inwood	233,386	1,563,684	336,096	1,227,588	1,229,419
Jefferson Market	368,156	662,680	515,837	146,843	122,489
96th Street	132,648	298,511	286,223	12,288	25,631
St. Agnes	153,770	276,785	302,374	-25,588	-26,244
Tompkins Sq.	70,189	133,358	233,121	-99,763	-78,121
Francis Martin	116,793	147,253	363,278	-216,025	-200,464
Grand Concourse	87,464	160,165	326,584	-166,419	-152,629
Hunts Point	101,933	319,091	285,383	33,708	42,787
Westchester Sq.	92,100	282,489	280,086	2,403	6,338
New Dorp	350,735	2,319,062	318,288	2,000,774	2,147,089
Library Centers					
Donnel	1,431,242	1,395,747	2,360,029	-964,282	-1,176,669
Mid Manhattan	1,938,887	(a)	(a)	(a)	(a)
Fordham	460,163	3,543,255	678,892	2,864,363	2,480,005
St. Georges	354,359	2,809,644	478,950	2,330,694	1,874,776

Note: Use is the sum of reference questions plus 1.183 times circulation. Benefits and costs are in dollars, and are defined in the text. (a) not applicable.

not be a close substitute. The valuation method is on a firmer footing in evaluating the neighborhood and regional facilities.

When use of juvenile materials is weighted 50 percent more than the use of adult materials, and reference questions are weighted at half the value of use of adult materials, the net benefit picture changes little. Only the Throgs Neck Branch moves from negative net benefits to positive net benefits. The number of branches with net benefits less than minus $100,000 drops from 26 to 24.

The estimates of benefits and costs presented here indicate that the New York Public Library operates many more branches than is dictated by efficiency criteria; that is, the consumers of library services in the city would probably be better off with fewer branches with the savings used either to lower taxes or increase other aspects of library services. Because the number of branches has grown since 1960 (and an additional branch is planned), one might conclude that efficiency has not been the operational criterion in the design of this library system. Library systems in other older cities may also be over branched, for example, in Chicago, Philadelphia, and San Francisco.

The analysis presented here could be improved in several ways. First, the estimates of use would be more accurate if attendance information were available for each location, even if only for sample periods. Second, the valuation of service might be improved with more detailed information about user travel time and costs in making library trips.

HOW MANY HOURS AND BOOKS?

In the above exercise the hours of operation, books in stock, and books added during the year are not taken into consideration. Because these characteristics of public library service are also very important budget items, it is appropriate to try to determine whether they are provided at efficient levels. Of the three steps in an efficiency calculation, the main emphasis here will be on determining how use varies with differences in service--namely, the production function.

Explaining Patterns of Use

Three characteristics of library service are related to use: the size of the stock, the number of additions to it during the last year, and the number of hours the facility is open. The size of the stock of materials in the library indicates the variety of materials available. Presumably, the larger the stock, the more likely that a user will find material of particular interest. Information from the branch libraries of the New York Public Library allows disaggregation of stock into adult and juvenile categories and book and nonbook (mostly recordings) categories. However, paperback stock volumes are not recorded for each facility. Therefore, the book stock figures understate stock by the amount of paperbacks on hand. Further disaggregation might be useful (for example, fiction and nonfiction), but only if use information were similarly disaggregated.

The number of materials added during the most recent year indicates the currency of the material. Recently published materials,

(for example, best sellers) are more in demand than older materials. Also, the library with a high volume of additions can respond to changes in users' tastes more quickly than the branch with a low volume of new materials, and should therefore be characterized by a higher rate of use. Additions are disaggregated in the same way as stock. No information about the addition of paperback books by branch is available.

Finally, the more hours the facility is open, the more accessible are the materials and the less planning a user must do in order to arrive when the library is open. The number of hours per week is calculated by dividing the total number of hours of service for the year by 52.

In addition to the above three service characteristics, one might also consider the proportion of staff that is professional. A predominantly professional staff may be better able to respond to reference questions than a nonprofessional staff, and may also play a role in improving the selection and presentation of materials. Libraries also sponsor programs, such as story hours, films, book talks, and the like. If these are viewed as promotional activity for the library, more programs might generate more library use. However, the proportion of professional staff and the number of programs offered appear to be secondary to stock, additions, and hours as indications of library use, and preliminary statistical investigations confirm this supposition. Also, because only 59 neighborhood libraries are available for observation, the cross-branch

statistical study has limited power to make fine distinctions in many dimensions. Therefore, these two secondary characteristics have not been taken into account in this analysis.

Library use can be disaggregated in several ways. The characteristics of service may influence different types of use differently. The most commonly observed indicator of use is circulation outside the library. Cross-system studies must control for differences in circulation caused by differences in the length of the loan period and in renewal policy; renewals typically are counted as additional circulations. By using branches within one system, such variation does not arise. Circulation statistics are disaggregated into adult and juvenile, book and nonbook categories, as is the stock information. The circulation figures, however, include the circulation of paperback materials, since library records do not distinguish between hard cover and paperback circulation. It is unfortunate that paperbacks are excluded from the stock figures but included in the circulation figures.

Circulation is only one component of library use; another is reference questions. The New York Public Library records the number of reference questions asked at each branch by adults and by juveniles during sample periods. Reference questions might be further disaggregated according to the skill and effort required to answer them. Such distinctions demand careful definitions and increase the cost of gathering the information. It is unusual for a library to keep detailed records

of reference questions, and this study benefits by the quality of information from the New York Public.

The third major component of library use entails the use of materials and facilities in the library. For example, Newhouse and Alexander [13] found that a substantial number of visitors to the Beverly Hills Public Library did not use any library materials, but simply used the facility as a study hall. Thus, an important category of library use is not reflected in data on circulation and reference questions. The simplest approach to monitoring in-library use would be to collect attendance information at each location. Sample surveys might provide more detailed data on rates of use of materials in the library. Because the New York Public Library does not maintain branch attendance records, we are unable to explore how service characteristics affect in-library use.

In all, 12 measures of use are related to service characteristics: total circulation (book plus nonbook), book circulation, record circulation, and reference questions are each examined for adults, juveniles, and all users (adult plus juvenile). In terms of adult users, the stock and additions of adult materials are used as service characteristics; in regard to juvenile users, the stock and additions of juvenile materials are used. In examining the use of books, the stock and additions of books are used as service characteristics; for records, the stock and additions of records are used. Thus, each use is related to the most relevant feature of the service.

In addition to the service characteristics specific to each branch, the location of each library relative to others may influence

use. Forty-one of the 59 neighborhood branches are located within one mile of another library facility. About one-sixth of neighborhood branch users indicated they live within 10 blocks of the library they use in a survey at 15 neighborhood branches. Library users do not seem to be clustered near the library. Therefore, it seems appropriate here to take explicit account of the spatial relationship among branches. Hours of service is used as the most important service feature of competing branches. For each branch, the number of hours of service at every other branch is divided by the square of the distance between branches and summed. In the case of a branch located near other libraries offering many hours of service, the library interaction variable will be large. Where other libraries are distant and offer few hours of service, the library interaction variable will be small. A significant negative coefficient on the library interaction variable will indicate that the proximity of a competing branch tends to reduce library use at particular locations.

Library use is also determined by the tastes of people who live in the vicinity of the library. Berelson, for example, cites several studies indicating that library use tends to increase with income and decline with age [2]. Feldstein emphasizes the finding that use increases with education [6]. Because income and education are closely related, it is difficult to distinguish the two effects; however, income is used here. Age distribution is measured in terms of the percent of total population enrolled in school below the college level.

In addition, access to libraries may be influenced by the density of population in an area. Transit service, for example, may

be better in a high-density area. People choosing to live in high-density areas may have different tastes than individuals living in low-density areas, even controlling for income and age distribution. The use figures are not deflated by population, so one would expect greater use in higher density areas. Other neighborhood population factors which may influence library use include ethnicity, sex, occupation, and length of employment. However, these characteristics are thought to be secondary to population density, income, and school enrollment, and preliminary statistical investigation confirms their secondary role. Because the neighborhood characteristic variables may reflect a constellation of neighborhood attributes, it is difficult to predict the signs of the coefficients of these variables; thus, two-tailed tests are applied.

Information about the three neighborhood attribute variables are available for 1970 by census tract. With over 700 tracts in the three boroughs, there is no obvious way to match tracts to libraries; the New York Public Library has approached the problem by defining catchment areas for each branch using census tracts. Several catchment areas are defined for planned branches or for branches that have been scaled down to station status. Some catchment areas, comprised of several tracts, are quite large, while others are small. Moreover, the assignment of tracts to branches ultimately involves some arbitrary decisions. Obviously, the residents of one tract may use several different branches, depending on their location in the tract and their preferences. Consequently, the catchment area notion is ignored here.

Instead, the tract attributes are each weighted by the square of the distance to each branch and summed over all tracts. Each borough is treated separately in this manner. By squaring distance, the attributes of nearby tracts are heavily weighted, while the value of attributes of distant tracts drops rapidly toward zero. Distance could be raised to some power other than two--a study of individual library users might yield a more precise parameter value. But such an exercise is beyond the scope of the present study. Because the tract attributes are entered in the estimated relationships as distance weighted indices, the absolute value of their coefficients has no direct meaning.

The use relationship defined thus far purports to describe how users respond to library services. But the managers of the library may design the service in light of patterns of use. Thus, the correlation between circulation and book stock may reflect both the fact that library managers provide large book stocks where use is known to be great. Since the evaluation of efficiency requires recognizing how user behavior responds to different services, it is necessary to distinguish user response functions from the choices made by library managers. Therefore, stock, additions, hours, and the spatial interaction variables are treated as endogenous; that is, partially determined by use patterns. The influence of library decisions can be purged from the user response function by a two-stage estimation technique. The first stage determines estimated values for the endogenous variables using a set of instrumental variables which may influence the library manager's choices but which themselves do not influence use.

Three groups of variables are used as instruments. Each reflects an influence on library decisions other than the desire to meet the demands of users. The first group is the cost of space. The cost of buying or leasing space for a library differs substantially within the city, and more branches can be efficiently provided in low-cost areas than in high-cost areas. Because no index of the cost of space for small areas in the city is readily available, land use information is used. The percent of land in residential use, and the percent of land in high-density areas with residential, industrial, and commercial use are entered as instruments relating to the cost of space [9]. The land use zone characteristics are weighted by the reciprocal of the squared distance to each library and summed. Nineteen-seventy census tract data on the value of housing units and contract rents is also used.

The second group of variables reflects the fact that library managers may be responsive to political pressures. The percent of votes for Mayor Beam in the 1973 election is used as an indicator of the political power of an area. This is, of course, a less-than-perfect measure of political power. The percent of registrants voting was used in preliminary investigations, but it proved no better than the Beam vote variable. Political power is a subtle, shifting attribute, and ethnic ties are often more important than geography. Although the mayor may be less important than other political figures, it nevertheless seems appropriate to include some measure of political activity, no matter how primitive. The Beam vote variable is recorded

for a random sample of 987 electoral districts, weighted by the reciprocal of the square of the distance to each library, and summed.

The third group of factors influencing library decisions consists of lagged values of the variables. Branches are costly to move or expand, and book stock is likely to expand to fill the available space. Moreover, additions to stock and hours of service may tend to follow past patterns. Thus, inertia in the design of the library system is substantial; the current pattern of branches, stocks, and hours is not likely to be modified instantly to respond to each variation in use. Therefore the hours, stock, and additions in 1960 are included as predetermined variables and used as instruments in estimating use relationships. In the case of 11 neighborhood branches which were not open in 1960, zeros are entered. (Two of these branches were closed for renovation in 1960.)

The estimated use relationships are reported in Tables 4 through 7: Table 4 covers total circulation (book and nonbook), Table 5 covers book circulation, Table 6 record circulation, and Table 7 reference questions. Each relationship is estimated for the 59 neighborhood libraries. The regional branches and centers are excluded because they may offer a wider assortment of services not reflected in the service attributes measured. (In fact, results with regional libraries or with centers do differ somewhat from those for neighborhood branches alone.) An ordinary least squares (OLS) estimate and a two-stage least squares (TSLS) estimate are reported for each relationship. One-tailed tests are applied to the four library attributes: positive coefficients are expected for stock, additions, and hours, while a

TABLE 4
Book and Nonbook Circulation Across 59 Neighborhood Branches

Variable	Adult		Juvenile		Total	
	OLS	TSLS	OLS	TSLS	OLS	TSLS
Stock	2.147***	-0.068	0.829***	-1.006	0.842**	-1.298
	(3.379)	(-0.019)	(2.564)	(-0.375)	(2.011)	(-0.509)
Additions	4.544***	0.983	5.134***	24.889	3.400***	13.826
	(2.405)	(0.025)	(4.394)	(1.168)	(2.838)	(0.593)
Hours	5423.610***	8155.520***	1782.500***	3063.810*	8918.250***	11356.700***
	(8.437)	(2.769)	(6.766)	(1.493)	(11.996)	(2.937)
Library Interaction	-9.680*	33.184	-5.851**	9.456	-16.174**	31.251
	(-1.539)	(0.770)	(-1.816)	(0.213)	(-2.332)	(0.456)
Population Density	-18.887***	-24.030	-0.504	1.133	-24.618***	-23.067
	(-3.123)	(-1.388)	(-0.180)	(0.105)	(-3.817)	(-1.010)
Percent Enrolled in School	-1.612**	-2.113	0.350	0.326	-1.406*	-1.440
	(-2.161)	(-1.195)	(0.853)	(0.161)	(-1.700)	(-0.543)
Income	4.582**	6.343	-2.230**	-2.320	3.958**	3.127
	(2.487)	(1.353)	(-2.454)	(-0.493)	(2.267)	(0.607)
Constant	-82007.200***	-110978.000***	-21383.600***	-55167.300	-101481.00***	-152098.00**
	(-8.518)	(-2.002)	(-4.295)	(-0.909)	(-9.419)	(-1.717)
R-Squared	.870	.661	.725	-1.610	.884	.413
F(7/51)	48.668***	14.207***	19.160***	-4.494	55.663***	5.131***

Note: These are linear regressions. OLS is ordinary least squares. TSLS is two-stage least squares, where stock, additions, hours, and library interaction are treated as endogenous, and percent Beam vote, percent residential land, percent dense land use, housing value, 1960 stock, 1960 hours, and 1960 additions are excluded exogenous variables. The numbers in parentheses are t-statistics. Statistical significance is indicated as follows: * .10 level; ** .05 level; *** .01 level, with one-tailed tests for additions, stock, hours and interaction; otherwise, two-tailed tests are applied.

TABLE 5
Book Circulation Across 59 Neighborhood Branches

Variable	Adult		Juvenile		Total	
	OLS	TSLS	OLS	TSLS	OLS	TSLS
Stock	2.238***	0.573	0.855***	-0.656	0.883**	-0.684
	(3.533)	(0.187)	(2.639)	(-0.317)	(2.090)	(-0.371)
Additions	4.978***	-7.961	5.185***	20.708	3.607***	9.847
	(2.532)	(-0.161)	(4.320)	(1.295)	(2.885)	(0.524)
Hours	5214.560***	7616.050***	1740.260***	3036.170**	7934.510***	1062.500***
	(8.300)	(2.590)	(6.799)	(1.839)	(11.893)	(3.564)
Library Interaction	-9.655*	33.461	-6.227**	2.075	-16.291**	25.645
	(-1.548)	(0.721)	(-1.948)	(0.062)	(-2.373)	(0.482)
Population Density	-18.116***	-24.823	-0.272	0.484	-23.656***	-23.106
	(-3.037)	(-1.232)	(-0.099)	(0.057)	(-3.733)	(-1.275)
Percent Enrolled	-1.455*	-2.083	0.416	0.848	-1.320	-1.044
in School	(-1.963)	(-1.370)	(1.044)	(0.576)	(-1.640)	(-0.572)
Income	4.268**	6.320	-2.300**	-2.942	3.959**	2.690
	(2.303)	(1.284)	(-2.539)	(-0.840)	(2.315)	(0.701)
Constant	-72290.000***	-99491.700*	-20961.200***	-50065.900	-98919.200***	-140295.000*
	(-8.309)	(-1.755)	(-4.298)	(-1.033)	(-9.359)	(-1.956)
R-Squared	.867	.606	.717	-0.708	.882	.613
F(7/51)	47.609***	11.194***	18.417***	-3.021	54.683***	11.537***

Note: These are linear regressions. OLS is ordinary least squares. TSLS is two-stage least squares where stock, additions, hours, and library interaction are treated as endogenous, and percent Beam vote, percent residential land use, percent dense land use, housing value, 1960 stock, 1960 additions, and 1960 hours are excluded exogenous variables. The numbers in parentheses are t-statistics. Statistical significance is indicated as follows: * .10 level; ** .05 level; *** .01 level, with one-tailed tests for additions, stock, hours, and interaction; otherwise, two-tailed tests are applied.

TABLE 6
Circulation of Records Across 59 Neighborhood Branches

Variable	Adult		Juvenile		Total	
	OLS	TSLS	OLS	TSLS	OLS	TSLS
Stock	3.186***	3.159*	0.887***	1.763**	2.161***	2.435*
	(6.714)	(1.507)	(3.712)	(2.257)	(5.728)	(1.646)
Additions	-1.096	-4.449	0.510	-0.849	-0.623	-4.115
	(-1.087)	(-1.052)	(1.230)	(-0.467)	(-0.855)	(-1.145)
Hours	131.389***	264.718**	60.135***	35.296	194.887***	340.415**
	(4.566)	(1.978)	(4.952)	(0.831)	(4.978)	(1.952)
Library Interaction	-0.319	1.704	0.030	0.633	-0.326	1.569
	(-0.909)	(0.645)	(0.204)	(0.645)	(-0.688)	(0.426)
Population Density	-0.588*	-0.744	-0.119	0.025	-0.748*	-0.816
	(-1.823)	(-0.899)	(-0.891)	(0.122)	(-1.746)	(-0.875)
Percent Enrolled	-0.059	0.030	0.018	0.008	-0.026	0.124
in School	(-1.298)	(0.176)	(0.928)	(0.137)	(-0.415)	(0.492)
Income	0.111	-0.088	-0.112***	-0.085	0.007	-0.280
	(1.192)	(-0.338)	(-2.697)	(-0.807)	(0.051)	(-0.692)
Constant	-1981.520***	-4116.840*	-458.576*	-375.618	-2418.640***	-4601.030
	(-3.541)	(-1.687)	(-1.985)	(-0.464)	(-3.258)	(-1.495)
R-Squared	.708	.241	.665	.453	.689	.285
F(7/51)	17.695***	2.319**	14.488***	6.044***	16.147***	2.905**

Note: These are linear regressions. OLS is ordinary least squares. TSLS is two-stage least squares where stock, additions, hours, and library interaction are treated as endogenous, and percent Beam vote, percent residential land use, percent dense land use, housing value, 1960 stock, 1960 hours, and 1960 additions are excluded exogenous variables. The numbers in parentheses are t-statistics. Statistical significance is indicated as follows: * .10 level; ** .05 level; *** .01 level, with one-tailed tests for additions, stock, hours, and interaction; otherwise, two-tailed tests are applied.

TABLE 7
Reference Questions Across 59 Neighborhood Branches

Variable	Adult		Juvenile		Total	
	OLS	TSLS	OLS	TSLS	OLS	TSLS
Stock	0.546**	-0.102	0.078	0.569	0.266*	0.706
	(2.342)	(-0.061)	(0.639)	(0.894)	(1.317)	(0.787)
Additions	3.365***	11.955	4.665	7.409*	3.890***	8.614
	(4.854)	(0.655)	(0.319)	(1.465)	(6.731)	(1.050)
Hours	970.761***	1142.750	316.187***	441.858	1381.290***	1040.520
	(4.115)	(0.838)	(3.102)	(0.908)	(4.189)	(0.765)
Library Interaction	-1.438	-7.387)	-1.783*	3.535	-3.407	-1.227
	(-0.623)	(-0.371)	(-1.430)	(0.336)	(-1.018)	(-0.051)
Population Density	-0.560	0.774	0.852	1.867	-0.271	4.349
	(-0.252)	(0.097)	(0.786)	(0.726)	(-0.087)	(0.542)
Percent Enrolled in School	-0.146	-0.332	-0.177	-0.561	-0.458	-0.871
	(-0.534)	(-0.405)	(-1.118)	(-1.172)	(-1.148)	(-0.934)
Income	-0.599	-0.081	-0.453	0.432	-0.518	-0.220
	(-0.886)	(-0.037)	(-1.253)	(0.387)	(-0.615)	(-0.121)
Constant	-15255.70***	-21588.60	-2778.110	-15247.700	-17974.600***	-35545.400
	(-4.318)	(-0.841)	(-1.442)	(-1.058)	(-3.458)	(-1.141)
R-Squared	.716	-0.177	.762	.151	.702	.197
F(7/51)	18.363***	-1.093	23.292***	1.298	17.159***	1.787

Note: These are linear regressions. OLS is ordinary least squares. TSLS is two-stage least squares, where stock, additions, hours, and library interaction are treated as endogenous, and percent Beam vote, percent residential land use, percent dense land use, housing value, 1960 stock, 1960 hours, and 1960 additions are excluded exogenous variables. The numbers in parentheses are t-statistics. Statistical significance is indicated as follows: * .10 level; ** .05 level; *** .01 level, with one-tailed tests for additions, stock, hours, and interaction; otherwise, two-tailed tests are applied.

negative coefficient is expected for library interaction. Two-tailed tests are applied to the other coefficients.

The most dramatic result is the relationship between use and hours of service; the amount of use of a library is very significantly associated with the number of hours of service. Currently, the neighborhood branches average just under 20 hours per week of service, down from 39 hours in 1960. The association between use and hours holds for both adult and juvenile materials, for books and records, and for reference questions.

Moreover, the result for hours persists in the two-stage estimates, where, for the most part, the influence of the other service attributes does not remain statistically significant. If the two-stage estimates are interpreted as the more correct estimates of user response, with the influence of library decisions purged by the first stage, then consumers seem much more responsive to changes in hours than to other attributes of service.

Stocks and additions also have statistically significant coefficients. Additions seem to be more important in relation to book circulation, while the quantity in stock is a more important variable in record use. Thus, it seems that books become obsolete faster than records. Perhaps best sellers are more important to public library patrons than are the largest selling records. The number of additions also appears to be important for reference questions, since currency of materials is associated with use.

Stock and additions do not appear to be significantly associated with use in the two-stage estimates, except for record circulation. In terms of book circulation and adult reference questions, the stock

of materials and additions to stock do not appear to be significant factors in use decisions. This lack of significance may be due to the weakness of the instruments in explaining library decisions; two-stage estimates are not as reliable as ordinary least squares.

The library interaction variable has a statistically significant negative coefficient in the total circulation and book circulation and in the juvenile reference question ordinary least squares estimates. The statistical significance of these coefficients reinforces the finding that the existence of nearby branches tends to reduce the use of a neighborhood library.

The three neighborhood characteristic variables yield some surprising results. First, population density shows a statistically significant negative relationship with book and record use by adults and no significant positive coefficient. Thus, the notion that library use will be greater in higher density areas because of easier access does not seem to hold. Rather, the tastes of people living in high- and low-density areas differ: those living in low-density areas appear to have a stronger preference for library services than those living in high-density areas, with income held constant.

Income has the expected positive coefficient for adult book use, but a surprising negative coefficient for juvenile book use. Since juvenile books are relatively inexpensive, perhaps higher-income households buy more juvenile books than low-income households and rely on the library to obtain the more expensive adult books.

The percent of population enrolled in school has an unexpected negative coefficient for adult book use and no other significant

coefficients. Because school enrollment is closely related to the number of young persons living in an area, and because library use is generally thought to decline with age, a positive sign would be expected. The negative coefficient indicates that adult book use is greater where there are fewer children.

The overall statistical power of the relationships is significant in all cases except the two-stage results for juvenile book use and for reference questions. The library service characteristics are strongly associated with library use in expected ways. The neighborhood characteristics also help explain library use, but in somewhat surprising ways. The two-stage results, while generally weaker than the ordinary least squares, emphasize the importance of hours of service as a determinant of patterns of use.

Efficient Operations

Using these careful estimates of relationships between library service characteristics and use, it is now possible to determine service efficiency in terms of hours, stock, and additions. The marginal costs of each activity were reported in Table 2. The marginal benefits of an additional unit of each activity are calculated in Table 8. The coefficients of the regressions in Table 4 and 7 are estimates of how use will respond to an increment in a particular library activity, other things equal. By weighting circulation by 1.183 to account for in-library use and adding reference questions one arrives at an estimate of the total increase in library use associated with one more unit of activity. Marginal use figures are reported in column (b) of Table 8. Thus an additional hour of service is associated

TABLE 8
Marginal Benefits and Costs of Hours, Stock, and Additions

Activity	Marginal Cost	Estimation Method for Use	Point Estimate of Use Per Activity	90-Percent Confidence of Use	Marginal Cost Per Use		Marginal Benefit	
					Point Estimate	90-Percent Confidence	Point Estimate	90-Percent Confidence
	(a)		(b)	(c)	(d)	(e)	(f)	(g)
Hours per Week	$2,317	OLS	11,392	10,360	$0.19	$0.22	$15,750	$13,675
		TSLS	14,475	7,488	$0.16	$0.31	$18,819	$ 9,884
Volumes in Stock	$ 3.93	OLS	1.26	0.36	$3.12	$11.07	$ 1.66	$ 0.47
		TSLS	0	0	--	--	--	--
Additions to Stock	$ 7.41	OLS	7.91	5.32	$0.94	$ 1.39	$ 10.44	$ 7.02
		TSLS	24.97	0	$0.30	--	$ 32.96	--

Notes: Marginal Costs are as reported in Table 2. The estimates of use involve multiplying the respective coefficient in Table 4 times 1.183 to reflect in-library use and adding the respective coefficient from Table 7. The marginal cost of increasing library use is found by dividing column (a) by columns (b) and (c) respectively. The value of a use is taken as $1.32, the average benefit per use for the 59 neighborhood branches in Table 3. OLS refers to ordinary least squares estimates and TSLS refers to two-stage least squares estimates.

with 11,392 more uses of the library using the ordinary least squares results, 14,475 using the two-stage results. Because the coefficients are subject to statistical error, it is appropriate to report a 90 percent confidence interval for the associated difference in use. The 90 percent confidence intervals are reported in column (c).

By dividing the marginal cost of an activity, say an additional hour of service, by the expected increase in use resulting, one can estimate the marginal cost of increasing library use in different ways, as reported in columns (d) and (e) of Table 8. The ordinary least squares estimates indicate that an additional library use could be generated for each $.19 spent in expanding hours. Spending $3.12 in expanding the size of the book stock at a branch will be expected to increase library use by 1. Spending an additional $.94 for new materials would expand library use by one.

An efficiently designed library system would expand each activity as long as the marginal benefit of an extra unit of the activity--for example, an extra hour of service--exceeds the cost of providing the extra unit. If the cost of an extra unit of the activity exceeds the benefit derived, then consumers would be better off with the savings in tax dollars or expenditure on a more productive item, and that activity should be cut back. As an activity is expanded, we expect that less benefit will be derived from each additional unit. As an activity is reduced, we expect each additional unit of cutback to have a larger impact on benefits. Thus, the estimates of marginal benefits presented here reflect the marginal values of current levels of library activities. The marginal benefits will differ at different levels of activity.

The average benefit of a library use at the 59 neighborhood libraries presented in Table 3 is $1.32, although there is substantial variation among the branches. The marginal benefit of an additional unit of activity can be compared with the marginal cost of the activity either by comparing the marginal cost per use of columns (d) and (e) with the value of benefits, $1.32, or by multiplying the estimated changes in use, columns (b) and (c) and comparing with marginal cost of the activity, column (a).

The marginal benefit of an additional hour of service each week substantially exceeds the assumed marginal cost. Using either the ordinary least squares or two-stage estimates, the point estimates or the 90 percent confidence intervals, the marginal gains from additional hours substantially exceed the marginal cost. The average of 20 hours per week offered at the 59 neighborhood branches of the New York Public Library is too low for efficiency. Expanded hours of service would generate substantial increase in library use worth more to consumers than the costs of the expanded service.

The marginal benefits of maintaining more volumes in stock is less than the marginal benefits derived. Thus, on average the neighborhood branches of the New York Public Library seem to be too large for efficiency. Because the biggest impact of stock on use seems to be for recordings, it may be that maintaining a larger stock of recordings is justified.

The acquisition of new materials seems to have benefits that exceed costs, at least for the point estimates. Thus, while the evidence is not as clear as for hours, there does seem to be a case

for acquiring more new materials. New materials seem to generate use worth more than their cost.

FEWER BRANCHES OPERATING MORE HOURS

Overall, then, there seems to be too many branches operating too few hours, buying somewhat too few new materials, but maintaining a stock of materials that may be somewhat too large. The evidence for the number of branches and the number of hours of service is quite clear, the evidence on stocks and new materials is less clear. Because the current mix of library activities favors extra branches rather than more hours of service, it is not possible to say whether the current budget is at the right level or not. The important finding is that an efficient library design would have fewer branches and operate more hours per week.

The influence of a hypothetical reallocation of budget to fewer branches operating longer hours can be estimated using the information developed above. The first step is closing branches. For the sake of the exercise, suppose that the seven branches with benefits at least $175,000 less than costs were closed. None of the seven are next to each other.[5] The closings would lead to an annual cost savings of $1.9 million dollars including the rental value of the space. With the branches closed, some of the library use would shift to remaining branches. For the sake of this exercise, let's assume that all the use shifts to nearby branches. In addition, some of the branches that are closed may have been nearest to some remaining branches. The best alternative for these remaining branches will now

be a more distant branch. Consequently, the value of library services at the next nearest branches will be greater.

The second step of this exercise is to assume that the cost saving from closing the seven branches is used to increase the hours of service at the remaining 69 facilities in the system. At $2,317 per hour, the $1.9 million made available by closing the seven branches will buy 11.9 hours each week for each remaining facility in the system. If each hour added 14,475 uses as suggested by the two-stage point estimates, the use of each branch would be expected to increase by more than 172,000.

The costs and benefits of each branch if 7 neighborhood branches were closed and the funds reallocated to longer hours are reported in Table 9. Of the remaining 53 neighborhood branches, only 4 have negative net benefits following the branch closings and expansion of hours. The assumption that the hours would be expanded the same at every facility is perhaps overly simple. The assumption that each additional hour will have the same impact in increasing use as the estimate of the first hour may be too strong. Nevertheless, the change in the efficiency of the operation--in the quality of service given the budget--is striking. Of course, the changes will make people in areas where branches are closed travel farther to get library services, and so they can be expected to oppose the shift. On the other hand, perhaps a branch system with fewer branches should have locations different than the current locations. The relocation of branches is not examined here.

TABLE 9
Estimated Use, Benefits and Cost of System with 7 Branches Closed

Neighborhood Libraries	Use	Benefit	Cost	Benefit-Cost
Allerton	321,227	372,379	311,753	60,626
Baychester	492,407	683,185	389,513	293,672
Castle Hill	221,154	257,774	197,121	60,653
City Island	207,879	551,963	106,701	445,262
Clason's Point	277,993	350,453	280,337	70,116
Eastchester	246,753	295,431	154,853	140,578
Edenwald	284,030	464,650	224,427	240,223
High Bridge	251,005	268,700	226,765	41,935
Jerome Park	405,962	408,848	209,451	199,397
Kingsbridge	326,798	312,547	313,576	-1,028
Melrose	304,976	403,803	227,440	176,363
Morrisania	236,726	313,436	259,364	54,072
Mosholu	356,730	473,232	259,013	214,219
Mott Haven	0	0	0	0
Parkchester	376,041	414,547	243,347	171,200
Pelham Bay	361,622	524,785	248,183	276,602
Riverdale	296,389	475,851	271,011	204,840
Sedgwick	358,730	349,833	113,735	236,098
Soundview	274,369	322,232	240,623	81,609
Spuytenduyvil	334,465	319,882	245,295	74,587
Throgs Neck	283,762	520,333	241,983	278,350
Tremont	359,106	384,387	201,660	182,727
Van Cortlandt	252,731	308,355	146,820	161,536
Van Nest	318,256	381,846	233,933	147,913
Wakefield	266,758	325,471	292,506	32,965
West Farms	0	0	0	0
Woodlawn Height	231,009	281,853	131,723	150,130
Woodstock	0	0	0	0
Aguilar	246,461	266,178	252,767	13,411
Cathedral	259,956	201,476	140,487	60,989
Chatham Sq.	474,589	593,236	303,036	290,200
Columbia	265,355	249,434	108,155	141,279
Columbus	214,144	256,972	191,519	65,454
Epiphany	435,460	367,528	310,021	57,507
58th Street	373,027	298,421	238,717	59,704
George Bruce	0	0	0	0
Ham Fish Park	281,909	253,718	227,959	25,759
Hamilton Grange	293,326	293,326	270,780	22,546
Harlem	208,772	198,333	178,875	19,458
Hudson Park	232,175	196,885	222,088	-25,203
Kips Bay	347,506	284,955	256,907	28,048
Macombs Bridge	190,528	190,528	63,116	127,412
Muhlenberg	291,211	306,354	232,168	74,186
115th Street	198,850	182,942	197,987	-15,045
125th Street	0	0	0	0

TABLE 9--continued

Neighborhood Libraries	Use	Benefit	Cost	Benefit-Cost
Ottendorfer	263,021	216,940	204,491	12,449
Riverside	494,054	469,351	289,891	179,460
Seward Park	0	0	0	0
67th Street	274,065	263,102	239,185	23,917
Washington Height	231,433	203,661	232,298	-28,637
Webster	240,250	206,615	154,654	51,961
Yorkville	506,607	435,682	341,638	94,044
Dongan Hills	314,335	706,109	214,581	491,528
Great Kills	402,298	1,372,093	241,586	1,130,507
Port Richmond	299,735	481,381	220,014	261,367
Stapleton	236,978	394,388	154,323	240,065
Todt Hill	325,028	741,480	179,925	561,555
Tottenville	219,469	1,610,902	117,082	1,493,820
West New Brighton	296,376	475,980	173,730	302,250
Bloomingdale	514,954	1,287,384	436,246	851,138
Countee Cullen	259,929	987,730	438,974	548,756
Ft. Washington	314,213	1,791,012	353,080	1,437,932
Inwood	405,400	2,716,178	363,633	2,352,545
Jefferson Market	540,170	972,305	543,374	428,931
96th Street	304,662	685,611	313,760	371,851
St. Agnes	325,784	586,411	329,911	256,500
Tompkins Sq.	242,203	460,185	260,658	199,527
Francis Martin	0	0	0	0
Grand Concourse	435,715	797,881	354,121	443,760
Hunts Point	290,922	910,702	312,920	597,782
Westchester Sq.	264,114	810,090	307,623	502,467
New Dorp	522,749	3,456,419	345,825	3,110,594
Donnel	1,603,256	1,563,495	2,387,566	-824,071
Mid Manhattan	2,110,901	(a)	(a)	(a)
Fordham	820,093	6,314,715	706,429	5,608,286
St. Georges	526,373	4,173,509	506,487	3,667,022

Note: Closing 7 facilities allows $1.9 million in expenditure to be distributed over the remaining 69 facilities, adding 11.9 hours of service at each attracting 172,014 addition uses. The use of the closed branches are reassigned to nearby branches, and the distances to the nearest branch is changed with the closings. (a) not applicable.

A POLICY PERSPECTIVE

The above findings may be difficult to convert into policy. The political process shapes library expenditure patterns, and efficiency considerations may not dominate the political scene. First, the political process recognizes the history of the institution and the possibility of seemingly irreversible changes. Second, equity consideration may play some role. Third, federal policy may have some impact on local choices. Fourth, the political process may be simply imperfect.

The current operation of the New York Public Library reflects the severe budget cutbacks of the 1970's. Instead of cutting back both hours and branches in an effort to retain an efficient mix, the Library has cut back hours severely while retaining almost all branches. Cutting back hours has been politically easier than closing branches. In January, 1976 the Library announced the planned closing of 8 branches as a way of coping with budget cuts. The announcement of closings created a substantial political reaction that prevented closings. Neighborhood citizen groups coalesced around the preservation of individual branches. While reductions in hours might be seen as temporary, the closing of branches may have been seen as permanent. Rather than accept the budget cuts as permanent, the political friends of the Library may have viewed cutting hours as a way of preserving the option of restoring former service levels.

On the other hand, the Library had been expanding the Library system into the 1970's. In 1960, 48 of the present 59 neighborhood

branches were operating and two others were closed for renovation. Thus, the number of neighborhood branches has grown by more than 15 percent over the last 20 years. Of the nine new neighborhood branches, six have opened since 1970. While the opening of new branches may have been an appropriate response to the changing location of library use, it may be that older branches should have been closed at the same time.

In 1960 neighborhood branches were open an average of 39 hours each week. Other urban library systems currently average in excess of 40 hours per week at branch locations. In 1970, however, the neighborhood libraries in New York averaged 48 hours of service per week, an above average number. The substantial growth in branch library activity during the 1960's, even as library use began to decline (it peaked in 1964), did not put the Library in a very good position to deal with the budget cuts in the 1970's.

Equity considerations may also play a role in shaping political support for the Library. Public library services are sometimes discussed in terms of their value for poor people. At the turn of the century and again during the Great Depression, the public library provided recreation without charge and offered access to learning for adults eager to better themselves. Evidence of the distributional consequences of library activities is not overwhelming, however.

If the net effect of the local government's library expenditures is to improve the relative position of poor people, then the beneficiaries of the services must have lower incomes on average than people who bear the burden of the taxes used to pay for the services.

The question of the incidence of the taxes used to pay for the library is not simple. Currently, over a quarter of the employees of the branch libraries of the New York Public Library are paid with federal Comprehensive Employment and Training Act (CETA) funds. Presumably, general revenue-sharing funds also have an impact. Federal revenue sources are moderately progressive. The share of library revenues accounted for by local tax sources may be less than 50 percent. The most important local tax is the property tax. Recent literature on the property tax indicates that it may be capitalized into land values or borne by the owners of capital. Therefore, the property tax is likely, except for administrative deviation, to be somewhat progressive. Those individuals earning higher incomes pay relatively more in taxes supporting local services than those earning lower incomes.

The beneficiaries of the service also seem to be disproportionately higher income earners. In particular, we find that adult use of the library is greater in areas with higher-income residents, whereas the use of juvenile materials seems greater in lower-income areas. Use as reflected by reference questions appears to be unrelated to income. Because the use of juvenile materials accounts for less than 30 percent of total use, the aggregate effect seems to be that higher income households use the library more than lower income households. This finding is generally in conformance with those of other studies, although the others do not differentiate between adult and juvenile use. Because the income variable is a distance-weighted index of census tract information, the coefficients cannot be used to calculate income elasticities of use.

If both the sources of finance and the use of the library are disproportionately represented among higher-income groups, it is possible that local expenditure on public library services is distributionally neutral. However, since neither the distribution of those who finance libraries nor the distribution of those who benefit from library services is very carefully observed, no firm conclusion about distributional consequences can be made.

Note, however, that just because the beneficiaries tend to have higher incomes or the services are distributionally neutral, this does not mean that the services should not be performed in the public sector. Even though not all citizens use the library, it may still have characteristics that make it substantially public in character, justifying its support by general taxes. That library users gain by library expenditure relative to nonusers does not in itself prove an inequity in the fiscal system. Nonusers may value the option of using the library, and so the apparent inequity may overstate the underlying welfare effect. Moreover, the important equity result is the net effect of the full fiscal system. Nonusers may gain disproportionately from other government services. The important equity result is that for the full fiscal system; there is no reason why each service matched with its source of finance should be distributionally neutral or progressive. Finally, the net benefit of services may be capitalized into land values.

Since in-library use has not been observed, we do not know the distributional gains from such use. Is in-library use greater

among lower-income groups? A better understanding of the distributional consequences of library activity requires more information on in-library use, particularly attendance data by branch.

Suppose that we accept the view that library services are distributionally advantageous. Suppose, too, that library services are used effectively by poor people, especially children, and that library use improves school performance and literacy levels, and is an important vehicle for social advancement by low-income urban families. (Note that each of these claims is unproven and indeed difficult to prove; the important issue is the effectiveness of libraries relative to other expenditures.) How would public library services best be provided to low-income households? The very substantial response of use of all kinds to the number of hours of service suggests that even low-income households respond to the number of hours. The high density of branches in low-income areas of the city, on the other hand, does not appear to have generated very high levels of use. It seems likely that the results of this study may also apply to library use by low-income persons; that is, low-income library users, like the average user, might be better served by longer hours in fewer larger branches. Low-income families may also value their time at lower rates than high-income families. Thus, it is not obvious why library services should be characterized by more branches and fewer hours of service in consideration of equity.

The combination of more branches and fewer hours of service may also be explained by the political environment that shapes the library system. Perhaps public library service is quite local relative

to the size of the city. The benefits of service in a particular location may be concentrated in a small area, while the costs of providing the branch service are widely diffused. Neighborhood demands for services may be made with little concern for costs; in effect, there may be a free rider among neighborhoods, with weak central control. This hypothesis represents a substantial simplification of a complex historical process which deserves more careful study. The point is that distributional impact across neighborhoods may play some political role.

Federal policy may have some impact on Library decisions. As already noted, over 25 percent of Library employees are federally financed CETA workers. President Carter has proposed new restrictions on CETA funds that would prevent professional librarians being employed with CETA funds. The central fact is that a substantial part of Library operations are contingent on the availability of federal CETA funds. In the present setting funding cuts lead to cuts in hours.

Federal grants are also supporting the construction of a new branch. While public works projects may be an appropriate response to high levels of unemployment in the city, the further expansion of library branches in a system already overburdened with too many branches is of questionable value. The operating costs of the new facility may force the further cutback in hours in other facilities. Six new branches in the Queens Borough Public Library, a separate system, remain unopened for lack of operating funds.

Finally, one must question whether the political constraints on the Library that have prevented a more rational response to budget cuts are perfectable. Presumably library users who live near branches that would be closed would be made worse off by the closing. At least those who have flexible enough schedules to be able to use the facility when it happens to be open may be worse off. Are such the dominant force in shaping the library services? Or is the tactic of preserving locations at the cost of low levels of operation throughout the system one that will yield more funds for libraries over some longer term? Perhaps better information about Library operations will improve the political outcome.

FURTHER RESEARCH

This essay may set the stage for additional efforts to understand efficiency in public libraries. The library use relationships might be estimated with different functional forms. They might also be explored overtime in an effort to discover why use began to fall perhaps a decade before services were cut. The lack of annual demographic information may hamper this inquiry. Finally, a study of individual users might refine the estimated relationships presented here.

NOTES

[1]An earlier version of this essay appeared as Working Paper #55 of the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University. Comments received at the Joint Center, at Yale, and at Vanderbilt have been helpful in making revisions. I would like to thank Richard Couper, John Cory, and Edwin Holmgren of the New York Public Library for their help with this study.

[2]A recruit professional librarian has an annual salary of about $11,220 and works a 35 hour week. Fringe benefits are about 30 percent of base salary. These figures imply a recruit librarian costs about $8 per hour. $44.56 per hour of library service suggests that the observed marginal costs of additional hours of public service are well above the extra cost of an additional librarian for a single hour.

[3]The relationship between stock and cost can be explored by relating costs to square feet and square feet to stock. The number of square feet in a facility are regressed on the stock of materials:

Square Feet = 6633.29 + 0.029 juvenile stock + 0.024 adult stock
(3.647) (0.187) (0.233)
+ 2.200 record stock R-squared=0.07 n=59
(2.192)

Among the neighborhood branches, there seems to be little relationship between the stock and space. For the whole system, the relationship is stronger. The number of square feet in the facility are related to maintenance and security costs:

Maintenance Cost = 5249.0 + $1.29 square feet R-squared = 0.70

(4.554) (11.80) n = 59

The marginal maintenance cost of $1.29 per square foot plus the approximate annual lease value of $5 per square foot suggests an annual space charge of $6.29 per square foot. Because the link between stock and space seems so weak among neighborhood branches it is not possible to relate the estimated space costs to the stock cost.

[4]The average cost for an adult hardback book including library discounts was $7.09; for a juvenile hardback the average price was $4.16. The average price for an adult paperback was $1.98 and for a juvenile paperback $1.26. About 28 percent of library acquisitions are paperback. Processing including ordering and cataloging adds an average of 34 percent to the cost of the materials. The processing costs on paperbacks are much lower than for hardbacks. These figures confirm the estimate of $7.31 for the average new addition to stock.

[5]The seven marginal branches are: Mott Haven, West Farms, Woodstock and Francis X. Martin Regional in the Bronx, and 125th Street, Seward Park, and George Bruce in Manhattan.

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