Libraries and return on investment (ROI): A meta-analysis

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Abstract

Purpose of this paper The need to communicate the value of libraries is growing, and especially now during the global financial crisis. As a response library valuation research is expanding and there is now a need for a status report.

Background

The library valuation field is on its way to generating a critical mass of empirical studies. The focus of this meta-analytical review is on the subgroup that reports a return on investment (ROI) or a cost-benefit ratio.

Methods used for the study

Meta-analysis is a quantitative analysis of findings of previous studies, conducted to infer general findings and lessons from prior empirical research. The dataset is 38 library valuation studies reporting a return on investment figure or cost-benefit ratio.

Findings

32 of the 38 studies are of public libraries, a number high enough to indicate a tenable result. The meta-analysis indicate that the patterns in the findings are consistent with expectations regarding the benefit types that are included in the ROI figure, the methods used, and the scope of the study.

Value of paper This study appears to be the first meta-analytical review of library studies reporting a return on investment figure. The tentative conclusion is that for each dollar invested in public libraries they return, on average, approximately four times more. This is a strong message with policy implications.

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Introduction

The global financial crisis we now are experiencing threatens citizens' welfare and jobs, and thus their possibilities to access and use private and public services. The research field *economics* is central and much debated these days.

Library economics has been part of the research field library management from the start of library and information science. From the 1980s and onwards, there was a growing interest in a special theme within library economics, that focused on the economic pressure on the library budgets as part of the increasing economic pressure of the public sector as a whole. This research interest was in part a reaction to the Thatcher-era and the right-wing politics that increased in West-Europe from the 1980's. Now we see a new development. During the last ten years a new research field has evolved from the wider research area library management and economics. This new field is library valuation research**,** and the number of library valuation studies and return on investment studies has increased considerably during the last years. Why is it so?

Public libraries receive a high proportion of the public funds for cultural activities and they therefore meet demands for more accountability. They need to prove how the taxpayers' money is used to benefit both the individual citizens and the local communities. Academic libraries, school libraries, and special libraries in different businesses meet similar types of demands, being asked for performance measurement, cost justifications, and return on investment from the administration of their university, school, or enterprise. These demands have been strengthening due to increasing economic pressure. There is no doubt that the pressure will increase considerable now. Due to the financial crisis, the Prime Minister of Norway in January 2009 warned of a stern budget situation in the municipalities, possibly affecting both schools and elderly care, he said. Public libraries are also a public task, and in Norway a municipality task, and risk to be squeezed in the competition of scarce public funds. In tight economic times people are especially conscious of spending their tax dollars wisely. Therefore, the need is strong to value or assess the libraries, i.e. to get an estimate of the worth, and even the monetary worth, of the libraries. This is the background for the evolving library valuation research field and this is why it is extra important now. Results from this research may be of special interest and usefulness now in the global financial crisis.

In a meta-analytic review of research literature reporting from contingent valuation of cultural resources, Noonan (2003) identified 72 original studies covering the topics of

archeology, the arts, broadcast and media, historical sites, heritage, libraries, museums, sports, and theatres. Only three of these studies dealt with libraries. However, the field of library valuation research has been fast-growing over the last decade. In 2007, two comprehensive reviews of the literature reporting from library valuation were published, one in the USA analyzing 17 American public library studies (Imholz and Arns, 2007) and the other in Sweden covering 43 studies worldwide, including all types of libraries, both public, school, academic, special, and national libraries (Wagman, 2007). Library economic research is thus shown to be expanding. However, the field of library valuation is still young. Studies differ in methods, aim, and scope. Lack of consistency in methodologies and applications limits the ability to replicate research, compare valuation results, and apply the research findings.

The two meta-analytic reviews of the research literature document that the library valuation field is on its way to generating a critical mass of empirical studies. The focus of this paper is on a subgroup of the library valuation studies, namely the part that reports a return on investment figure (ROI) or a cost-benefit ratio. A much used formulation is to report that the ROI ratio is, for instance $1:$3.50, meaning that for each dollar of taxpayers' money invested in the library, the library returns a value or benefits of $3.50 to the citizens.

A majority of the studies reviewed in the two meta-analyses, arrives at a return on investment figure, communicating that for each dollar invested by public funding the libraries return a value that is higher. Put simply, the return on investment is a figure that tells how high the return is on each dollar invested. This paper aims to look closer at these studies and their valuation results, e.g. the specific monetary amounts reported in this part of the library valuation studies. At this stage of the development of empirical library valuation research, such a status report of this subgroup of studies will give new insights.

Two reviews of studies in the field of library valuation

The thorough American review, *Worth Their Weight: An Assessment of the Evolving Field of Library Valuation* (Imholz and Arns, 2007) was carried out by Americans for Libraries Council, involving experts from within and beyond the library community, including economists.

> "Our first observation is that over the past decade, public library valuation researchers *have* sought out and adopted valuation methods from the field of economics that allow the library to put a dollar value on its programs and services and show efficient use of tax dollars in cost/benefit terminology. The studies we reviewed clearly demonstrate

> the field‟s growing sophistication, showing advancement from simple questionnaires to complex surveys, and from simple economic cost/benefit assessments to complex economic algorithms and forecasts" (Imholz and Arns, 2007, p. 5).

Their second observation is that the field is moving from mastery of purely economic measures to becoming more concerned about how to incorporate the more intangible social dividends of the public library, and to find new way to express and quantify learning values and cultural benefits. They underscore the need to draw upon education research and social science expertise to be able to expand the value concept to incorporate the complex public library value, and even to redefine monetary value and efficiencies in the context of sustainable, healthy communities. The third observation is that at the current stage of library economic valuation, the systematic growth and development of the field could benefit considerably from formalized forums for sharing of information, datasets, and experimental tools.

Imholz and Arns (2007, p.15) summarize the economic valuation methodologies used in library valuation. The term "methodology" refers to conceptual frameworks that support specific approaches to data analysis. They find that the public library valuation studies they reviewed rely on two types of methodologies: those that produce estimates of *direct benefits* and *indirect benefits*, respectively. Cost/benefit analysis, contingent valuation and secondary economic impact analysis are methods that are used. The latter uses formulas and algorithms for assessing the secondary economic impacts of industries, such as library employees living locally and spending their wages in local businesses in the community thus contributing to the local economy; the diverse library expenditures, etc. Such measurements are also considered "indirect" benefits, often found by using modeling software called "input-output" models. Typically, they use data available from the Bureau of Economic Analyses at the U.S. Department of Commerce. Results from both contingent valuation and secondary economic impact analysis are often included in different cost/benefit analyses.

Section II of the American report are made up of 17 study summaries of methods and analysis including scope of the study and applied methodology; results including key findings of the economic analysis; and possible survey questions. The reviewed library studies in this meticulous report are limited to the U.S.A. and are of public libraries only.

The Swedish review (Wagman, 2007) was initiated by the Swedish Library Association. It aims to give an overview of the international research literature about library valuation. Cost/benefit analyses and economic impact analyses of libraries have mostly been conducted

in the U.S.A., Canada, Australia, New Zealand and the U.K, states Wagman based on her brief reviews of 43 studies. This report differentiates between cost/benefit analysis and economic impact analysis. The cost/benefit analyses may use different methods to find the data that represent the benefits of the libraries: market analogy methods, revealed preferences and stated preferences. Of the stated preference methods, the contingent valuation method is the one most used. Economic impact analyses measure spin-off or multiplier effects of library expenditure including maintenance and construction of library buildings, books, equipment, etc., library employee wages used locally, etc. Economic impacts are indirect benefits.

The report underscores the variation among the 43 library valuation studies. The structure of the reviews is based on library type, starting with public libraries, followed by academic libraries, special libraries, and national libraries. The review ends with two short summaries of impacts of libraries upon i) businesses and industries and ii) local consumption, especially in nearby shopping centres.

Methodology

Meta-analysis is the quantitative analysis of findings of previous empirical studies. The objective of meta-analysis is to combine the results of previous studies to reach a summary conclusion about a body of research. By this comparative method, the attempt is to infer general findings and lessons from prior applied research. Originally meta-analysis was developed in medical sciences as a statistical tool for developing comparative studies and creating synthetic knowledge from controlled experiments. In the last decades, meta-analysis has spread also to the social sciences and has proven to be a research instrument of great potential for research synthesis of previous empirical results, for hypothesis testing, and benefit transfer (Smith and Pattanayak, 2002). The main objective of modern meta-analysis is to synthesize in quantitative terms the results from a set of empirical studies on a common, or largely similar, issue. In contrast, *value transfer* aims to develop a quantitative framework for the transferability of value estimates for policy decisions (Nijkamp et al., 2008). The general idea is to explore the use of prior and original valuation studies within the same research field and to transfer their estimated values to new and similar areas where value estimates are needed for policy decisions.

Libraries are non-market goods with largely homogeneous characteristics; they are familiar to the population and are perceived and used in similar ways worldwide. Thus, a meta-

analysis of library valuation studies could gain new insights and be useful as information for decision-makers.

The dataset for the analyses in this paper is 38 library valuation studies that report a return on investment figure (ROI) or a cost-benefit ratio, identified in Imholz and Arns (2007), Wagman (2007), and by literary search on the web. Measures of the central tendency in the data material, *mean* and *median*, are calculated and the variations of the ROI magnitude are explored in a multivariate regression analysis.

Findings

Table I gives an overall presentation of the library valuation studies that report a ROI figure by year, country, and scope.

"Take in Table I"

The variable 'Year' depicts the publishing year of the empirical studies and shows a small but steady growth of studies during the last decade. The exception is 2006, when the number of studies reaches a top score with as much as twelve studies published. The high number is partly explained by Colorado State Library, which conducted individual return on investment studies of eight public libraries that year.

With regard to the countries where the studies are conducted, United States is clearly the dominating nation with as many as 30 studies out of the total of 38, amounting to almost 80 percent. Only in five other countries there are published library valuation studies reporting a return on investment figure, encompassing the U.K., Australia, New Zealand, South Korea, and Norway. The same asymmetry is shown by the variable 'Library type'. Public libraries are the predominating library type, counting 32 studies. The remaining six studies are distributed with two studies exploring the value of academic, special and national libraries, respectively. This skewness in the frequency distribution of published studies with regard to country as well as to library type is a striking trait in the data material. Thus, too few library valuation studies are yet conducted for academic, special and national libraries and too few studies are carried out in countries other than the U.S. to make statistical analyses of all library types internationally.

The variable ‘Scope’ in Table I tells whether the study explored the library value of an individual library (18 studies), the value of libraries at the level of a county (seven studies), a region (one study), a state (six studies), or at the national level (five studies).

In Table II, the variables ‘Scope’ and ‘Country’ are crosstabulated and a somewhat more balanced distribution is seen. In the U.S. there are six library valuation studies at the state level, one at the regional level, seven at the county level and 15 are studies of individual libraries. At the national level there are five studies altogether, two conducted in the UK, one in Australia, New Zealand, and Norway, but none in the U.S.

<“Take in Table II”>

At this stage of the development of the ROI library valuation studies, a complete list of all the studies can help to give an overall picture of this part of the library valuation field. Table III displays all the 38 studies. In the first column, the studies are numbered and identified by geographic place and first author of the published report, which is fully referred to in the reference list. Each study is described by publishing year, scope, country, method(s) used, benefit types included, and the concluding ROI figure.

“Take in Table III”

The variable ‘Method’ in Table III is given three values: 1) depicts a combination of cost/benefit analysis and contingent valuation; 2) depicts a combination of cost/benefit analysis and market analogy methods or measurement of secondary economic impacts; and 3) is methods other than these. Cost/benefit analysis is the most used means of characterizing the dollar benefits that accrue to communities when they provide tax support to public libraries. The cost/benefit analyses in the dataset use different methods to find the data that elicit the benefits of the libraries. Those given the value 1) do so by applying contingent valuation to bring out the benefits the library give the individual citizens and the community. Contingent valuation is a survey methodology developed to assign value to public goods, based on the individuals’ stated preferences. The technique draws upon both economic theory and methods from survey research and aims to elicit people’s willingness to pay in money amount for a change in the provision of a non-market good, for instance the public library. Hypothetical scenarios are described and the success of the technique is dependent upon a realistic scenario

description to give reliable answers. In several of the library studies given the value 1) a broader definition is given of the term 'contingent valuation', including methods not based on stated preferences but other methods to estimate the monetary value on non-market goods, e.g., the value of time and the travel cost methods.

The cost/benefit analyses given the value 2) on the variable 'Method' find the data that represent the benefits of the libraries either by market analogy methods or by measuring secondary economic impacts. A cost/benefit analysis that use a market analogy method is described by Imholz and Arns (2007, p. 15): "It does so by assigning a cost or purchase price to a library service or collection item and comparing this amount to the value of that service or item to library patrons and their communities. The resulting 'benefit-to-cost ratio' measures the benefits per dollar spent. If the ratio is greater than one, the community receives benefits in excess of costs." In a cost/benefit analysis using measurement of secondary economic impacts, the library's impact on the rest of the economy can be calculated, e.g., its contribution towards employment, income, consumption expenditures, and state or local government revenue in the form of taxes. Economic impact studies are an established methodology in economics. The secondary impacts of libraries are usually found by tools called 'input-output' models, typically supplied with data available from official sources such as the Bureau of Economic Analysis, the Department of Commerce, and national and local statistics.

The value 3) on the variable 'Method' is given to only two studies, who have developed their own models for estimating the benefits of the libraries.

The variable 'Method' given these three values is, however, not unambiguous but registered after best judgment. Most of the studies use more than one method to arrive at the return on investment figure. In some of the studies, several methods are applied to measure the same good (here: the library) and function as a calibrating factor thus heightening the reliability of the result of the measurement, given as the ROI figure. In these studies, the final amount or result may be determined as the average of the results from the different methods. In other studies, different methods are used to measure different aspects of the good library, such as *direct value* and *secondary economic benefits*. Here, the value amounts found by the different methods are summed up to determine the total value. To further complicate, a few studies do both.

The variable 'Benefit types' describes whether the study includes direct benefits only in the ROI figure or whether both direct and indirect benefits are included.

What is the return on investment in libraries?

For each dollar invested in libraries, how much do they return? On basis of the 38 ROI studies, is it possible to generalize? The central tendency of the return on investment values can be analyzed by mean and median, which are two different measures for characterizing a data material. The arithmetic mean is the average. The median is defined by half of the studies reporting a lower figure, and the other half a higher figure. The median often better expresses the common-run since it is not, as is the mean, affected by an excessively high or low figure.

<"Take in Table IV">

Table IV shows the variations in the return on investment of the studies conducted at different levels. The central tendency is not varying much. Studies undertaken at the national level have the lowest mean (3.0) and median (3.5), indicating that the studies at this level return a value of 3.5 to each dollar invested, while library valuation studies at the state level have the highest median and return as much as five times per dollar invested. Studies at the individual level and the county level lie within this range. These figures, however, must be viewed with caution since the number of studies on the national, state, and county levels is too low to draw conclusions, only five and six studies respectively.

"Take in Table V"

In Table V, second column, ROI statistics is given for all 38 studies. The minimum reported valuation amount is 1.1 and the maximum is 10. Mean and median is 4.3 and 4.2, respectively, with a standard deviation of 2.02.

In the third column of Table V, the return on investment in public libraries only is calculated since the number of valuation studies of the other library types is critically low. The number of 32 public library studies, however, should be high enough to indicate a tenable result. The ROI mean and median for all public libraries are 4.5 and 4.4, respectively. The last column of Table V shows the mean and median of the public library studies within the U.S. only, since as much as 27 studies are conducted there. The results are a mean of 4.9 and a

median as 4.6 for the public libraries in the U.S., which is consistent with but slightly higher than the results for all the public library studies regardless of country.

Multivariate regression analysis

The following meta-analysis is used to assess whether the patterns in the findings are consistent with expectations regarding the benefits types that are included in the ROI figure, the methods used in the studies, and the scope of the study, see Table VI for description of the explanatory factors. Due to the critical shortage of ROI studies of library types others than the public library and in countries other than the US these two independent variables ('Library type' and 'Country') are omitted from the analysis.

The dependent variable, ROI, is certainly influenced by many explanatory factors. Multiple regression analysis is suitable for exploration of the relationship between a continuous dependent variable (ROI) and a number of independent variables. It is based on correlation but allows a more sophisticated exploration of the interrelationship among a set of variables. This makes it appropriate for real-life, rather than laboratory-based, research questions (Pallant, 2007). In the multivariate regression analysis, the ROI figure is analyzed in light of several independent variables at the same time. Table VII displays the impact on ROI of each of the explanatory factors, controlled for the impact of the other independent variables.

In this analysis, the independent variables were entered in blocks (hierarchical multiple regression) to assess the ability of each of the independent variables to explain the variation in the dependent variable (ROI). In Block 1, 'Benefits types' is shown to be positive and significant at the 5% level, indicating that the ROI increases considerably, as expected, when both direct and indirect benefits are included. However, the adjusted R^2 is low (0.009), explaining only one percent of the variation.[1] In Block 2, 'Method' is positive and significant at the 10% level, showing that cost/benefit analysis (CBA) combined with market analogy methods or measurements of secondary economic impacts gives a higher ROI figure than CBA combined with contingent valuation. Also this result accords with expectations, since there is a requirement to be conservative when designing contingent valuation studies. This independent variable has a substantial explanatory effect, increasing the explained variance to

[1] R^2 is the *coefficient of determination* which displays how much of the variance in the dependent variable that is explained by the independent variables. *Adjusted* R^2 is used for small samples because it corrects the value to provide a better estimate of the true population value (Pallant, 2007).

eleven percent (Adj. R^2=0.107). The last block in Table VII, include the dummy variables for scope, showing the effect on the ROI figure of studies conducted at a national, state, county or individual library level, with the state level as reference category. Of these levels, only the county level is significant at the 5% level and highly positive. By including scope, explained variance increases to 16 percent. Obviously, the ROI studies vary in ways the explanatory factors included here do not fully capture, and further research is needed to explain more of the variance.

The results of the meta-analysis do indicate that the patterns in the findings are consistent with expectations. The validity of meta-regressions relies heavily on consistency in the goods being valued across studies (Noonan, 2003). Regarding this aspect, the library valuation field has a good position, due to the dominant similarities of libraries. Another critical aspect, however, is consistency among the measurements and measuring methods and here there is a clear need of more research in the library valuation field. To my knowledge this meta-analysis is the first of return on investments in libraries and must be considered as preliminary and interpreted with caution.

Concluding remarks

This paper has started a mapping of the proportion of library valuation studies that report a ROI figure, attempting an exploratory "taking stock of progress" in this field. The analyses of the dataset show that for this subgroup of the field of library valuation research, the critical mass of studies has not yet been reached for academic, school, special, and national libraries. A substantial increase in valuation studies of these library types is necessary to reach a new stage in the development of this research field in order to reach a basis on which conclusions can be drawn.

For public libraries, however, a tentative conclusion can be draw. The results shown in these studies indicate that for each dollar of taxpayers' money invested in public libraries, the libraries – on average – return a value to the citizens of 4 to 5 times more. This conclusion is drawn on basis of a considerable amount of studies of the same good, namely public libraries, which have strong similarities all over the world. This is a strong message with policy implications. **"**Money speaks", as the American saying goes. Promoting the value of the libraries in the community also through economic statements can be quite effective. Speaking

in terms of dollars and cents seem to have a heavy impact on people, both politicians and ordinary citizens, who may not register the value of library services otherwise.

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Table I: Published library valuation studies reporting a ROI figure.

Year	**No of studies**	**Country**	**No of studies**	**Library Type**	**No of studies**	**Scope**	**No of studies**
1995	1	United States	30	Public	32	National	5
1999	1	U.K.	2	Academic	2	State	6
2000	4	Australia	2	Special	2	Regional	1
2001	2	New Zealand	1	National	2	County	7
2002	2	South Korea	2			Individual library	18
2003	1	Norway	1				
2004	3						
2005	5						
2006	12						
2007	3						
2008	4						
Total	38		38		38		37[a]

[a] One study could not be categorized after scope.

Table II: Scope and country of the library valuation studies.

Scope of studies						
	National level	State level	Regional level	County level	Individual level	Total
USA		6	1	7	15	29[a]
U.K.	2					2
Australia	1				1	2
New Zealand	1					1
South Korea					2	2
Norway	1					1
Total	5	6	1	7	18	37[a]

[a] One American study could not be categorized after scope.

Table III: Library valuation studies described by year, library type, scope, country, method, benefit types, and return on investment (ROI). ***(Continues on next page)***

Study	Year	Library type	Scope	Country	Met-hod[a]	Benefit types	ROI
1. Wisconsin, see NorthStar	2008	Public	State	USA	2	Direct	4.06
2. Wagga Wagga, see Hider	2008	Public	Ind.library	Australia	1	Direct and indirect	1.33
3. South Korea, see Chung	2008	Publiv	Ind.library	South Korea	1	Direct and indirect	1.85
4.Illinois, see Luther	2008	Academic	Ind.library	USA	3	Direct	4.38
5. Indiana	2007	Public	State	USA	2	Direct	2.38
6. South Korea, see Chung	2007	Special	Ind.library	South Korea	1	Direct and indirect	1.97
7. Vermont, see Kotch	2007	Public	State	USA	2	Direct and indirect	6.96
8. Buffalo and Erie	2006	Public	County	USA	2	Direct	6.07
9. Ohio, see Value for Money	2006	Public	Regional	USA	2	Direct	3.81
10. Pennsylvania, see Griffiths, King&Aerni	2006	Public	State	USA	1	Direct and indirect	5.50
11. Denver, see Colorado State Library **a**	2006	Public	Ind.library	USA	1	Direct and indirect	4.96
12. Douglas, see Colorado State Library **b**	2006	Public	County	USA	1	Direct and indirect	5.02
13. Eagle Valley, see Colorado State Libr. **c**	2006	Public	Ind.library	USA	1	Direct and indirect	4.28
14. Fort Morgan, see Colorado State Libr. **d**	2006	Public	Ind.library	USA	1	Direct and indirect	8.80
15. Mesa, see Colorado State Libr. **e**	2006	Public	County	USA	1	Direct and indirect	4.57
16. Montrose, see Colorado State Libr. **f**	2006	Public	Ind.library	USA	1	Direct and indirect	5.33
17. Rangeview, see Colorado State Libr. **g**	2006	Public	Ind.library	USA	1	Direct and indirect	4.81
18. Carnegie library of Pittsburgh	2006	Public	Ind.library	USA	2	Direct and indirect	5.87[b]
19. Middle Country, see Kamer 2006a	2006	Public	Ind.library	USA	2	Direct	4.59
20. Northport, see Kamer 2006b	2006	Public	Ind.library	USA	2	Direct	3.30
21. Suffolk County, see Kamer 2005a	2005	Public	County	USA	2	Direct	3.93
22. Port Jefferson, see Kamer 2005b	2005	Public	Ind.library	USA	2	Direct	4.14
23. Norway, see Aabø	2005	Public	National	Norway	1	Direct and indirect	4.00
24. South Carolina, see Barron et al.	2005	Public	State	USA	2	Direct and indirect	4.48
25. Florida, see Griffiths et al. 2004	2004	Public	State	USA	1	Direct and indirect	6.54
26. British Library, see Pung et al. 2004	2004	National	National	UK	1	Direct and indirect	4.40
27.Miami-Dade	2004	Public	County	USA	2	Direct	3.85[b]
28. Illinois etc., see Holt et al. 2003	2003	Public		USA	1	Direct	1.34[b]
29.National Library of New Zealand	2002	National	National	New Zealand	1	Direct and indirect	3.50[c]

Continues

Study	Year	Library type	Scope	Country	Met-hod[a]	Benefit types	ROI
30. US Special library, see Bromley	2002	Special	Ind.library	USA	1	Direct	1.26
31. St.Louis, see Holt et al. 2001	2001	Public	Ind.library	USA	1	Direct and indirect	3.75[b]
32. Baltimore, see Holt et al. 2001	2001	Public	County	USA	1	Direct and indirect	4.50[b]
33. Birmingham, see Holt et al. 2001	2001	Public	Ind.library	USA	1	Direct and indirect	2.00[b]
34. King County, see Holt et al. 2001	2001	Public	County	USA	1	Direct and indirect	7.50
35. Phoenix, see Holt et al. 2001	2001	Public	Ind.library	USA	1	Direct and indirect	10.00[b]
36. UK, see Morris et al.	2001	Public	National	UK	3	Direct	1.13
37. Virginia, see Harless and Allen	1999	Academic	Ind.library	USA	1	Direct and indirect	3.50
38. Australia, see Haratsis	1995	Public	National	Australia	1	Direct and indirect	2.00

[a] Method given the value 1 represents a combination of cost/benefit analysis and contingent valuation, method given the value 2 represents a combination of cost/benefit analysis and market analogy methods or measurement of secondary economic impacts, and value 3 represents methods other than these.
[b] These studies have reported more than one ROI ratio. The average amount is included in the table.
[c] This study valued the National bibliographic database and the National union catalogue only.

Table IV: Variance of mean and median of ROI i library valuation studies conducted at different levels.

ROI	**National level**	**State level**	**County level**	**Individual level**
Mean	3.0	5.0	5.1	4.2
Median	3.5	5.0	4.6	4.2
N[a]	5	6	7	18

[a] The total number of studies is here 36 because the one regional study is omitted and another study cannot be categorized according to scope since it valuates several individual libraries in three different regions.

Table V: Variance of mean and median of ROI in all 38 valuation studies, in all public library studies, and in the US public libraries.

	All studies		**All public libraries**	**All US public libraries**
Mean	**4.3**		**4.5**	**4.9**
Median	**4.2**		**4.4**	**4.6**
Std.Dev.	2.02		2.08	1.91
Min.	1.1		1.1	1.3
Max.	10.0		10.0	10.0
N	**38**		**32**	**27**

Table VI: Variable definitions

Variable name	**Description**
Benefit types	Types of benefits included in the ROI figure. Direct benefits only are coded 0; both direct and indirect benefits are coded 1.
Method	Studies using cost/benefit analysis (CBA) and contingent valuation are coded 0; CBA and market analogy methods or secondary economic impacts are coded 1.
Scope: National level	Scope of the study is the national level.
Scope: County level	Scope of the study is the county level.
Scope: Individual level	Scope of the study is an individual library.

Table VII: Meta-regression model. Explanatory factors impact on ROI.

		DEPENDENT VARIABLE	
		ROI Log-linear OLS[a]	**Adj. R^2**
	INDEPENDENT VARIABLES		
Block 1	**Benefit types**	0.577 (0.265)**	0.009
Block 2	**Method**	0.471 (0.258)*	0.107
Block 3	**Scope[b]: National level**	0.354 (0.313)	
	Scope[b]: County level	0.589 (0.267)**	
	Scope[b]: Individual library	0.259 (0.221)	0.158
	(Constant)	0.473 (0.299)	
	N	38	

Standard errors are indicated in parentheses.
** Indicates significance at the 5% level.
* Indicates significance at the 10% level.
[a] Ordinary least square (OLS).
[b] For the dummy variable scope, the reference category is the state level.