

THE CONTINGENT VALUATION METHOD APPLIED TO THE CHILEAN NETWORK OF PUBLIC LIBRARIES*

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Andrea Báez M¹
Andrea Rebolledo A²
Bruce A. Seaman³
Juan José Price E⁴
Ana Farren⁵

ABSTRACT

We apply contingent valuation methods to estimate part of the social wellbeing attributable to the Chilean Network of Public Libraries, and the relationship between such benefits and the socioeconomic characteristics of both users and nonusers. Other than Báez and Herrero (2012), this method has not been applied to Chilean cultural assets. Moreover, studies of public libraries are rare, and we believe this is the first regarding libraries in Latin America. Chile is an interesting case as a member since 2010 of the OECD although still facing enormous challenges in terms of reducing high and persistent inequality of both income and access to educational resources, a reality that might partially explain our findings.

The main results are: (i) both users and nonusers are willing to make a pecuniary contribution to keep the network operating; (ii) the mean willingness to pay (WTP) is lower for known users compared to those likely to be less frequent users, and only modestly lower compared to non-users; (iii) this valuation gap is lower for only those interviewees who declare being sure or very sure about their WTP, and when we control for income - results consistent with economic theory; and (iv) among those who are not willing to pay, many are willing to contribute voluntary work to help with the management of libraries, an interesting result that implies the possibility of reducing service provision costs while generating a sense of involvement by local communities regarding these services.

The further clarification of the determinants of the valuation gap between residents and non-residents, and users and nonusers is an important topic for future research. We suspect that the social dynamics within Chile and the visible patterns of inequality are important factors in understanding the social impacts of such local community services. Not just another contingent valuation study, this extension to a relatively stable but socially fragile South American country contributes to the field and potentially to public policy.

¹ Instituto de Estadística (Universidad Austral de Chile)

² Centro de Innovación (Universidad Católica de Chile).

³ Department of Economics, Andrew Young School of Policy Studies (Georgia State University, EEUU)

⁴ Instituto de Economía (Universidad Católica de Chile).

⁵ Consultora independiente.

* Francisco Illanes of DIBAM (Directorate of Libraries Archives and Museums) provided valuable data.

1. Introduction

The National System of Public Libraries in Chile (or SNBP using its Spanish acronym) represents another case of a cultural resource with characteristics of a quasi-public good. This presents a common public policy challenge. There are reasonably clear measures of the cost the country incurs in conserving the library system (an internal operating budget of about \$11 million U.S per year over the past four years, plus an initial external grant of \$9.2 million U.S. from the Bill and Melinda Gates Foundation) but we do not have clear measures of the benefits generated for society as a whole. The economic estimation of these social benefits is critical for designing public policies and allocating financial and human resources to this system. The social benefits are also complicated by the clear goal of the public library system to target such services on the poor population (estimated at about 13.5% of the Chilean population), and that part of the population living in relative isolation (about 3.0% of the population, many of which would also be considered poor). Therefore, this is a social program likely to be funded largely by the population of metropolitan Santiago (about 36% of the total population), but with benefits dispersed much more widely throughout the country. The challenge of conducting that fuller cost-benefit analysis is ongoing.

We use the contingent valuation method to estimate part of the social benefit the SNBP generates. With the exception of Báez and Herrero (2012), this method has not been used in the field of cultural policy in Chile. And in the case of public libraries this method has been rarely applied even on an international level, with this being the first application to a Latin-American country.

The analysis derives relevant information about the social benefits public libraries generate and about the relationship between this social value and the socioeconomic characteristics of those who visit and use them, as well as among those who are rarely or never direct users. Such results could improve the effectiveness of those who manage and work in these libraries by revealing to them how the community uses and values their work. And stakeholders such as local governments, donors, foundations, and other contributors also have an interest in better understanding the return on public and private sector investments in this area (Holt & Elliott, 2003).

We analyze the determinants of the participation decision (paying or not paying) and of the magnitude of the willingness to pay (WTP) to maintain the services of this network. For this we apply an in-person survey to a sample of users (people interviewed in libraries) and to a sample of residents (people interviewed outside of libraries who may or may not be users), in which interviewees were asked for their WTP using a double-bounded dichotomous question format (Hanemann, 1991).

Both samples are representative of the national population, and for the econometric estimation we consider socioeconomic, demographic and geographic explanatory variables. Additionally, we control for income level and stated purpose of the visit to the library when explaining participation gaps and the WTP of the various sample groups. We also present a more reliable and potentially more conservative estimation of WTP by restricting the

results to those who revealed high degrees of confidence when answering questions about their willingness to pay.

The next section describes the National System of Public Libraries in Chile. The third section provides further background information about the contingent valuation method, followed by a section reviewing the few other studies that have applied this method to assess the social benefits generated by public libraries. We then discuss the sampling methods and questionnaires used in the pilot surveys, followed by a section describing how the field work was conducted. Section seven presents the econometric model with the description and discussion of the results provided in section eight. In the final section we present our conclusions and recommendations and describe our plans for extending this research.

2. The National System of Public Libraries in Chile

The purpose of the National System of Public Libraries (SNBP) is to “*contribute to the development of the members of a particular community and their own identity, with the participation of the community acting as a bridge between the accumulated culture and the free access to information, knowledge and recreation*” (Dirección de Bibliotecas, Archivos y Museos, 2014). Thus, public libraries are envisioned not only as a space for recreational reading, but also as a cultural center and an axis for strengthening the bonds of the local community while at the same time fulfilling economic, social and educational functions.

Among the services offered by the SNBP is *Biblioredes* (interaction between library and internet use), *Bibliometro* (with locations for loaning books within the public transportation system), the Library of Santiago (the largest and most modern public library in the country), Wireless Service (transport conditioned to function as mobile libraries), *Bibliotren* (a module in the gardens of the National Library integrated with Bibliometro), the *Casero del Libro* (loaning points for books within free community fairs), *Teachers' Corner* (specialized collections for teachers), *Memories' Corner* (compilations of contents of local history), *Children's Corner* (rooms in public libraries that encourage the joy of reading in children), and a *Book for Healing Me* (spaces reserved especially for the loaning of books, games and toys in pediatric wards of some hospitals).

We consider a universe of 425 libraries that are a part of the first of the mentioned programs (Biblioredes), which in December 2013 recorded 20.8 million sessions of free internet access, 1.4 million users and 681 thousand digital training courses (in classroom and remote mode) provided to 351 thousand people (Dirección de Bibliotecas, Archivos y Museos, 2014). Of these libraries, 95.1% are administrated by the municipalities with the management of the rest dependent upon nonprofit private groups or on municipal corporations. However, their digital content and training are funded by Biblioredes, which gets its budget directly from the Central Government.

3. Contingent Valuation Methods

The socioeconomic value of the public library network represents the monetary expression of welfare that a population derives from their existence and consists of two main sources: use value, related to the welfare people derive from using the services offered by libraries, and the non-use value (passive use value), related to the welfare derived by people just from knowing that public libraries exist and/or are available for their future use or for the use of third parties, including future generations.⁶

When observable (market) data are available, the share of social value related to the use of a particular good or service can be measured using traditional valuation methods (Seaman, 2006).⁷ The problem occurs when the value of use is not observable (in the absence of a market for that good or service) and/or when what one wishes to capture are the various non-use values, which by their nature are not observable. For this type of study, methods based on stated preferences are used, which make obtaining measures of Willingness to Pay (WTP) for the access to these services possible.⁸

Among these methods the one most widely used is the Contingent Valuation Method (CVM) (Noonan, 2002), which is based on the application of surveys containing a definition of the good being valued and a series of WTP questions. While not originating with cultural economics, it has been adapted extensively within cultural economics, and there has been a special issue of the *Journal of Cultural Economics* devoted to its application (Vol. 27 (3-4), 2003). In this paper we follow the recommendations of prior researchers (e.g., Arrow, Solow, Portney, Radner & Schuman, 1993), i.e., we perform face-to-face surveys using dichotomous valuation questions, reminding respondents of the budgetary constraints they face and asking for their WTP.⁹ We do not suggest amounts as if they were indicative of the actual cost of providing the service.¹⁰ The specific details are explained in the following sections.

⁶ The specific components of non-use value have been identified as existence, option, altruism and inheritance values (Throsby, 2006).

⁷ See also ERS Research and Consultancy (2011).

⁸ This method has gained popularity as a valuation technique for a number of sectors where social demand (valuation) is not observable, such as the conservation of public sites, the creation of national parks and preservation of endangered species, among others.

⁹ We did not ask for their Willingness to Accept (WTA) payment to compensate for the loss of the library assets, which conceptually and empirically tends to be greater than their WTP for several reasons. The first is the endowment effect, which indicates that people can declare a WTP consistent with their budgetary constraint, which they know well, while the WTA is usually based on hypothetical cases, not considered in their budget. Second, experiments in behavioral economics and psychology show that people feel more pain from losses than pleasure from gains even if the gains and losses are equivalent in magnitude (Kahneman, Knetsch & Thaler, 1990; and Epstein, 2003). For these two reasons, studies based on the CVM tend to use the WTP (rather than the WTA) which also has the advantage of determining a more conservative lower bound of benefits.

¹⁰ To avoid an anchoring bias (see e.g., Seaman 2006; Epstein 2003).

4. Literature Review

In the field of cultural property there has long been a growing use of the CVM. Most studies in this area indicate that both users and non-users declare high WTP to maintain well-preserved cultural goods and services availability and that the largest part of this valuation is explained by the non-use values [e.g., Bille Hansen (1997, 2002)]. It is also commonly found that the WTP increases with income and education, and decreases with distance from the cultural asset [e.g., Bille Hansen (1997, 2002)].

In Chile the work of Báez and Herrero (2012) is best known for using the CVM to evaluate a program of restoration of the urban cultural heritage of Valdivia (a city about 460 miles south of Santiago). Those researchers studied the WTP of tourists for a guided tour of the main heritage sites with the payment method being an entry ticket. Meanwhile, the passive use value of residents was calculated as an annual amount of voluntary donation paid to a hypothetical non-profit foundation responsible for the restoration and maintenance of the heritage sites. The Valdivia study was innovative in using the WTP results to measure the benefits as part of a more comprehensive cost-benefit study of specific strategies for restoring the urban cultural heritage of the city so as to maximize the net social rate of return on any such investments.

On an international level beyond Chile the evidence is wider and includes some work on libraries.¹¹ In the work of Holt and Elliott (2003) the authors present the design of a CVM for small and medium sized public libraries in the United States, based on earlier work by the same authors conducted on large public libraries. In this case they applied two contingent valuation measures: in the first, the value of library services is evaluated using a measure of the additional amount they would pay users if the services of the library did not exist (a willingness to accept approach), while the second method performs a survey asking for the WTP to maintain services rather than have them reduced or eliminated. They claim that the results reveal very high benefits, with public investment in libraries having a positive rate of return between 22% and 150% depending on the library considered.

In England a contingent valuation study was applied to the British Library (2004), concluding that this venerable institution (the national library of the U.K. with arguably the largest catalogued collection in the world) generates social value equivalent to 4.4 times the level of public funding and that only 16% of its total economic value is direct use value. In line with these results the FESABID¹² of Spain reported in 2014 the results of economic valuation for the library network. The ratio of social benefits to public investment was reported to vary between 2.49 and 3.04, considering the value users assign to the services as well as the amount that non-users are willing to pay through taxes (Gómez Yáñez, 2014).

¹¹ In analyzing the studies of CVM specifically dedicated to public libraries, one should be careful not to directly extrapolate the results of institutions that have a greater access, number of users, public funding, etc., to the Chilean libraries, since it is possible that the results are not of the same magnitude. However, the fact that they all show a positive return on investment suggests that the Chilean case is unlikely to be an exception.

¹² Federación Española de Sociedades de Archivística, Biblioteconomía, Documentación y Museística.

Finally, the work of Aabø (2005) presents the application of CVM to Norwegian public libraries establishing measures for the WTP and WTA¹³. Regarding the willingness to pay measure, the obtained valuation is similar to the fiscal cost of providing the service. With the willingness to accept approach, an average valuation above 2,000 Norwegian krone compared favorably to the cost of provision of 400 krone, although many respondents declared a null value. This asymmetry in the results is consistent with the prior observation regarding an expected upward bias when using willingness to accept measures.

5. Sampling

The sample consisted of two groups: people interviewed in libraries (users) and people interviewed in places different from the libraries, for example, in the town square often far removed from the location of the library (residents).

Library (user) surveys

First, we conducted surveys in libraries, where by definition the respondents are considered users. For this group, quota sampling is used, for which the group was subdivided into regions and, subsequently, in rural and urban sectors according to a proportion of 30 and 70 per cent respectively.¹⁴

Libraries from all of Chile's fifteen regions (as of 2007) were included in the sample, adding up to a total of eighty libraries. In addition, libraries and cities with the most visitors to libraries have been weighted more heavily, and then a second weighting was carried out with the purpose of measuring each region's significance. Subsequent to quota sampling, we conducted a random sampling to select the subjects to be interviewed in each library.¹⁵

The sample of users represents 40% of the total surveys. The sample size of the *users'* group has been established based on the confidence level of 95% with an error of 3%, considering the flow of users in recent years, applying the respective correction factor. A sample size of 1,024 valid interviews was obtained.¹⁶

Resident surveys

The sample of residents represents 60% of the total interviews. The sample size for this group contained an error of 2.5%. After applying the correspondent correction factor for

¹³ Willingness to Accept

¹⁴ We defined rurality according to the criteria of the National Institute of Statistics (INE) for the settlement called *Pueblo* (people, in Spanish).

¹⁵ For libraries where the flow of visitors has been very low, all of the people who visited the library while the pollsters were there were surveyed.

¹⁶ This number of surveys taken is not exactly equal to the number of surveys that was actually utilized, due to contingencies specific to field work. The final number of obtained useful surveys was 909, as is indicated further in this paper.

finite populations, a sample size of 1,075 valid interviews was obtained.¹⁷ The sample size was then stratified according to the population size of the selected locations.

Residents were asked to indicate the last time they had visited a library so as to classify them into “resident users” and “non-user residents” with the criterion for inclusion in the user group being a stated last visit to a library of less than twelve months ago, with non-users being defined as those who declared never to have visited a library. Note that residents are defined as “resident-users” by the rather weak test of having visited essentially at least once within the last twelve months. Although we are lacking data on frequency of visits, such resident-users are likely to be less frequent and intense users of libraries than those interviewed within libraries that by contrast are labeled as “users.” Since non-user residents earn that designation by claiming to have never visited one of the libraries, it is clear that that group is highly unlikely to derive any direct use value from that system. Via these distinctions, even though the sampling distinguishes only between users and non-users, we managed to distinguish a total of three categories with the obtained information: users (from the library surveys), resident users (likely to be infrequent users) and non-user residents (from the resident surveys). The WTP of the first two groups represents use-value and non-use value, while by definition the WTP for non-user residents only comprises the option and other non-use values.

6. Field work

The field work consisted of a pilot stage in the Metropolitan Region of Chile (Santiago and its environs) and then an implementation stage of surveys throughout the entire country.

Pilot Survey

The pilot survey was implemented in the communes of Santiago (Santiago itself is a small part of the metropolitan area), Quinta Normal and Providencia, for resident surveys, and in libraries in Lampa, San Ramón and Quinta Normal (Biblioteca de Santiago) for the user surveys. The results reveal that 33% of residents are willing to contribute (participate) to avoid a closure of the library network. This percentage rises to 57% in the case of those who were interviewed in one of the three libraries. This is expected due to the fact that within the group of residents there are people who never before had visited a library (non-user residents) hence eliminating any direct use-value from their consideration of whether to “participate.”^{18 19}

Those who expressed their willingness to contribute to prevent the closure of libraries were asked for the maximum amount they would contribute (in the format of an open question), and that information was used to build the price vectors that are used in the field work on a

¹⁷ This number of surveys is not equal to the number of surveys that was finally obtained for analysis, due to contingencies specific to the field work. The final number of utilized surveys was 784, as is indicated later in this paper.

¹⁸ Residents, as was previously explained, can be users and non-users. In analyzing the surveys applied on a national scale, the results are presented distinguishing three categories: users interviewed in libraries, resident users and non-user residents.

¹⁹ This result is repeated at the national level, as is explained later in this document.

national level (see next section). That is, interviewees in the pilot surveys generated the “norms” regarding prices in contrast to such price vectors being linked to known costs of service provision or the expectations of the researchers.

National Survey

Based on the pilot survey results, we calculated a set of price vectors that were applied to the field work, using the double-bounded dichotomous choice method (Hanemann, 1991).

We split the sample into four groups, distinguishing between users and residents of both isolated and not isolated communities²⁰ and we then randomly assigned people from each group into each of the vectors, making sure that each vector had an equal number of respondents (see Table 1).

Table 1
Number of people surveyed, by groups

	Residents	Users	Total
Isolated communes	215	182	397
Not isolated	861	843	1,704
Total	1,076	1,025	2,101

Table 2 below shows the different price vectors that were used in the final field work. Price vectors, as noted, were assigned randomly and set an amount for the first question and another for the follow-up question. The second amount is higher if the answer to the first question was *yes* and lower if the answer was *no*. For example, if a person was assigned the price vector number 3, they will be asked whether they would contribute \$6,000 pesos (see the notes to Table 2 regarding currency values). If the answer is affirmative, in the follow-up question they will be asked if they’d contribute \$8,000 pesos, while if the answer was negative, the next question will ask if they would contribute \$4,000 pesos. The interrogation, with respect to the valuation question, ends after the second question, regardless of the answer to it.

Table 2
Price vectors (Chilean pesos, double-bounded format)

Vector	First amount	Second amount (If the answer is <i>Yes</i> to the first amount)	Second amount (If the answer is <i>No</i> to the first amount)
1	2,000	4,000	1,000

²⁰ That is, a group of users is in isolated communities, another group of users is not in isolated communities, a third group of residents is in isolated communes and a fourth group of residents is not in isolated communities. We repeat that residents may be users or non-users. “Isolated” is defined by the Chilean Inter-ministerial Committee for the Development of Extreme and Special Zones (CIDEZE) based on having a low level of accessibility, with a small and highly dispersed population, having low coverage of basic public services leaving then in a disadvantaged and unequal social condition relative to national development.

2	4,000	6,000	2,000
3	6,000	8,000	4,000
4	8,000	10,000	6,000
5	10,000	12,000	8,000
6	12,000	15,000	10,000
7	15,000	20,000	12,000
8	20,000	30,000	15,000

Notes to Table 2: The currency symbol for the Chilean peso is \$, but to avoid confusion it will always be identified as pesos; at the time of the survey, the approximate average exchange rate with the U.S. dollar was 600 pesos per dollar making \$6,000 pesos equivalent to about \$10 U.S., \$8,000 pesos about \$13.33, and \$4,000 pesos about \$6.67. Approximate per capita income in Chile is \$15,135 (U.S.) vs. \$53,805 in the United States, making \$10 (U.S.) within Chile similar to a “real price” of \$35.55 (U.S.) within the United States, with \$13.33 = \$47.40, and \$6.67 = \$23.70 after applying that same adjustment. Both Chile and the United States have significant degrees of inequality in income and wealth, with Chile having the highest Gini coefficient measure of unequal incomes of all thirty-four OECD countries in 2011 (0.503) and the United States having the fourth highest (0.389, increasing to 0.401 in 2013); the 2011 average among all OECD countries was 0.32. Measured as a multiple of the average income of the top 10% of the population vs. the average income of the lowest 10% of the population (after taxes and transfers, adjusted for household size), Chile is second among OECD countries at 26.5 with the United States third (18.8). The OECD average is 9.6 (2012 data). Data are from OECD.Stat.

The advantage of this methodology is that it ensures greater dispersion ranges for future estimates and limits the anchoring bias by using only a double-bounded format.²¹ We have also incorporated a certainty question in order to reduce the possible bias resulting from the hypothetical nature of the exercise.

Below we describe the actual valuation questions, which differ of course depending on whether the survey was conducted inside or outside the library. These questions were posed only after describing the object of study in some detail and reminding the interviewee of the existence of a budget constraint. In addition, the question is dichotomous (yes or no), and only those who answered yes (those who we call “participants”) were then asked for a particular amount.

Valuation question for users interviewed in libraries

This is one of the 450 libraries that exist in Chile and it belongs to the National System of Public Libraries. Currently, the services delivered by this library and all the others are free for those who visit because they are funded by the state and by municipalities. Suppose, however, that additional contributions were required to maintain these services, without which these services would have to be closed, along with the network of libraries that offer them, which would imply that the neighbors of these current libraries would no longer be able to access the book lending services, free internet and computers, and to training and cultural activities and reading-encouraging activities that are delivered here. Based on this information and taking into account your household income and expenditure on other

²¹ Seaman (2006)

goods and/or activities, would you be willing to give a monthly monetary contribution to maintain these services?

Valuation question for residents

In Chile there are 450 libraries belonging to the National System of Public Libraries, one of which is in this commune. Currently, the services delivered by this library and all the others are free for those who visit because they are funded by the state and by municipalities. Suppose, however, that additional contributions were required to maintain these services, without which these services would have to be closed, along with the network of libraries that offer them, which would imply that the neighbors of these current libraries would no longer be able to access the book lending services, free internet and computers, and to training and cultural activities and reading-encouraging activities that are delivered here. Based on this information and taking into account your household income and expenditure on other goods and/or activities, would you be willing to give a monthly monetary contribution to maintain these services?

7. Econometric Model

Methodology

In this section we present the econometric method that will be used to model the WTP considering the responses obtained for each price vector.

Simple Dichotomous Model (Probit)

The WTP of a particular person i is not observable; we can only observe the person's response to the valuation question: if his or her answer is affirmative, we then conclude that his willingness to pay is greater than the amount that is asked for. Thus, the answer of a certain person i to the valuation question (y_i) can take one of two values: $y_i = 0$ if the person answers *no* and $y_i = 1$ if the person answers *yes* to a certain amount to be paid t_i , which, as was previously explained, varies randomly between individuals. The WTP can be modeled as a linear function as follows:

$$WTP_i(z_i, \varepsilon_i) = z_i\beta + \varepsilon_i$$

In the above equation z_i is a vector of explanatory variables (for example, income and education), β is a vector of parameters and ε_i is the error. Since the person will answer *yes* if and only if $WTP_i > t_i$, the probability of observing a positive response given the explanatory variables is:

$$Pr(y_i = 1|z_i) = Pr(\varepsilon_i > t_i - z_i\beta)$$

Assuming that the error follows a normal distribution with zero mean and constant variance $\varepsilon_i \sim N(0, \sigma^2)$, the normalized error v_i is normal with zero mean and unit variance $v_i \sim N(0,1)$:

$$Pr(y_i = 1|z_i) = \Phi\left(\frac{\mu}{\sigma} - t_i \frac{1}{\sigma}\right)$$

$\Phi(x)$ is the cumulative function of a standard normal function . The difference with a normal probit is that the t_i variable is added. To estimate this model, the normal probit command is used adding t_i as an explanatory variable, with which $\hat{\alpha} = \hat{\beta}/\hat{\sigma}$ and $\hat{\delta} = 1/\hat{\sigma}$ are obtained. From this, the result is that $\hat{\beta} = -\hat{\alpha}/\hat{\delta}$ and therefore:

$$E(WTP|\bar{z}, \beta) = \bar{z}' \left[-\hat{\alpha}/\hat{\delta} \right]$$

where \bar{z}' is the vector that contains values of interest to the explanatory variables (e.g. mean, median).

This is the base model which serves to illustrate how the dichotomous model operates with the follow-up question process that is described below.

Dichotomous model with follow-up section (second question)

According to this model, each person is asked if they are willing to pay a certain amount t^1 and then they are asked if they would be willing to pay a second amount t^2 , which will be higher or lower than the first depending on whether the answer the first question is affirmative or negative, respectively. Thus, the model defines four possible cases or results.

1. If the person answers *yes* to the first question (t^1) and *no* the second (t^2), then $t^2 > t^1$. In this case it follows that $t^1 \leq WTP \leq t^2$.
2. If the person answers *yes* to the first question and *yes* to the second, it follows that $t^2 \leq WTP < \infty$.
3. If the person answers *no* to the first question and *yes* to the second, then $t^2 < t^1$. In this case it follows that $t^2 \leq WTP \leq t^1$.
4. If the person answers *no* to the first question and *no* to the second, it follows that $0 \leq WTP < t^2$.

Cases 2 and 4 are similar to the only possible result from the previous model in which there are no defined ranges for the WTP.

To estimate this model we use the methodology based on a bivariate probit proposed by (Haab & McConnell , 2002). This method allows the distribution of the WTP variable to vary from one question to the other, and thus allows the model to consider the correlation among the errors of both equations (Haab & McConnell , 1997). This is explained in more formal terms below.

Being WTP_i^1 and WTP_i^2 the willingness to pay asked for in the first and second question, respectively, assume that:

$$WTP_i^j(z_i^j, \varepsilon_i^j) = z_i^j \beta + \varepsilon_i^j \text{ con } j = 1,2$$

where $\varepsilon_i^j \sim N(0, \sigma_j^2)$ with $j = 1, 2$. With this we can define the correlation between the errors of the two equations as:

$$\rho = \frac{\sigma_{12}}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

σ_{12} represents the covariance between the errors of the two equations. As in the previous discussion we can derive the maximum likelihood function of a bivariate normal distribution, which can be estimated as a bivariate probit model. If y_i^1 and y_i^2 are dichotomous variables that capture the answer to the WTP questions, we have that the probability that *yes* is answered to the first WTP question and not to the second is:

$$\Pr(y_i^1 = 1, y_i^2 = 0 | z_i^j) = \Pr(s, n) \text{ with } j = 1, 2$$

The odds that a person's answers follow one of each of the four cases presented earlier, are defined by:

1. $y_i^1 = 1, y_i^2 = 0$

$$\Pr(s, n) = \Pr(WTP^1 \geq t^1, WTP^2 < t^2)$$

which, after some algebraic arrangements, allows us to establish the following expression for $\Phi_{\varepsilon^1 \varepsilon^2}(\cdot)$, which corresponds to the cumulative distribution function of a normal standard bivariate function with zero mean, unit variance and a correlation coefficient of ρ .

$$\Pr(s, n) = \Phi_{\varepsilon^1 \varepsilon^2} \left(-\frac{t^1 - \mu^1}{\sigma_1}, \frac{t^2 - \mu^2}{\sigma_2}, -\rho \right)^{22}$$

2. $y_i^1 = 1, y_i^2 = 1$

$$\Pr(s, s) = \Pr(WTP^1 \geq t^1, WTP^2 \geq t^2)$$

as in the previous case, from this expression another is obtained for a cumulative distribution function of a normal standard bivariate function with zero mean, unit variance and correlation coefficient ρ .

$$\Pr(s, s) = \Phi_{\varepsilon^1 \varepsilon^2} \left(-\frac{t^1 - \mu^1}{\sigma_1}, -\frac{t^2 - \mu^2}{\sigma_2}, -\rho \right)$$

3. $y_i^1 = 0, y_i^2 = 1$

$$\Pr(n, s) = \Pr(WTP^1 < t^1, WTP^2 \geq t^2)$$

From which it follows that:

$$\Pr(n, s) = \Phi_{\varepsilon^1 \varepsilon^2} \left(\frac{t^1 - \mu^1}{\sigma_1}, -\frac{t^2 - \mu^2}{\sigma_2}, -\rho \right)$$

²² Given that $\Pr(a \leq X < b) = F(b) - F(a)$.

$$4. \quad y_i^1 = 0, y_i^2 = 0$$

$$\Pr(n, n) = \Pr(WTP^1 < t^1, WTP^2 < t^2)$$

From which it follows that:

$$\Pr(n, n) = \Phi_{\varepsilon^1 \varepsilon^2} \left(\frac{t^1 - \mu^1}{\sigma_1}, \frac{t^2 - \mu^2}{\sigma_2}, \rho \right)$$

Taking the answers to each of the questions, we can define the i -th contribution to the function of maximum likelihood of the bivariate probit as:

$$L_i(\mu|t) = \Phi_{\varepsilon^1 \varepsilon^2} \left(d_{1i} \left(\frac{t^1 - \mu^1}{\sigma_1} \right), d_{2i} \frac{t^2 - \mu^2}{\sigma_2}, d_{1i} d_{2i} \rho \right)$$

where the variables $d_{1i} = 2y_i^1 - 1$ and $d_{2i} = 2y_i^2 - 1$ take the value of 1 if the answer is positive, and -1 if the answer is negative.

Once the bivariate probit is estimated, we need to estimate the WTP. In this case the confidence interval for the WTP is estimated using the method of Krinsky and Robb for willingness to pay for mean and median values. Basically this method, through simulation, allows the examination of the distribution of complex functions and nonlinear parameters that are estimates in this case of the WTP (Krinsky & Robb, 1986).

8. Results

Descriptive Statistics

The following table shows the number of respondents in libraries and elsewhere (residents). As was explained above, we make a distinction between those residents who declare they visit the library regularly or have visited at least one of the libraries in the network (residential users) and those who have not (non-user residents). The information is consolidated and separated for each of the following geographical areas:

- Northern Zone (Regions I, II, III and IV and XV);
- Central Zone (Regions V, RM, VI and VII); where RM indicates the metropolitan region around Santiago
- Southern Zone (Regions VIII, IX, X and XIV); and
- Most Southern Zone (Regions XI and XII).

Since the central area contains the Metropolitan Region of Santiago and the largest number of libraries, it is obvious that it will have generated a greater number of surveys. Significantly fewer interviews took place in the most Northern and Southern regions, given that they constitute a significantly smaller fraction of the population (even considering the northernmost city of Arica and the southernmost city of Punta Arenas).

Table 3
Number of people surveyed

	Users (A)	Residents (B)	Resident users	Non-user residents	Total (A+B)
Northern Zone	85	96	30	66	181
Central Zone	428	481	210	271	909
Southern Zone	326	157	68	89	483
Most Southern Zone	70	50	21	29	120
Total	909	784	329	455	1.693

Table 4 below shows descriptive statistics. We see that the participation rate (percentage of people who are willing to make a contribution) is less in the case of non-users, which is expected, since this group does not use the services and therefore has a null direct use value. To explain this difference we control for the influence of other variables, which generates an initial important partial result. That is, it is also noted that the average monthly income of users is smaller than that of respondents belonging to the group of residents, which, as we will argue in a later section, could partially explain the higher WTP of the latter group. Finally, it is interesting to note the increased participation of the women who were interviewed, which could be explained by the greater time this group should have available to visit libraries due to their lower participation in the work force in Chile (INE, 2015).²³

Table 4
Descriptive statistics by group

	Users	Residents	Residents	Residents
			Users	Non-Users
Number of people surveyed	909	784	329	455
Average age (years)	39	37	37	37
Proportion of women (%)	56%	59%	60%	59%
Average monthly household income (\$ Pesos)	453,906	508,152	500,836	513,466
Says would make a monetary contribution (%)	52%	51%	56%	48%

In the following table we make the distinction for each of the interviewed groups between those who say they are willing to contribute money (positive answer to the valuation question) and those that are not. These groups have been called "participants" and "non-participants" respectively.

Table 5
Characteristics of Participants and Non-Participants (users)

	Average household income	Participants	Non Participants	Total
	Users	(\$ Pesos)	465,044	442,469
	(%)	52%	48%	100%

²³ This should at least be true in the case of the user population.

Residents users	(\$ Pesos	525,683	469,692	500,836
	(%)	56%	44%	100%
Non-user residents	(\$ Pesos	542,087	487,500	513,466
	(%)	48%	52%	100%

Table 6 below presents the views of users and non-user residents on a number of questions related to the importance of libraries for them and for the rest of the community. It is interesting to note that the scores are higher for users of libraries than for users interviewed outside libraries. This is consistent with the fact that the intensity of use is greater in the case of the first group.²⁴ The valuation non-users made, as can be expected is lower than in the other two groups. The answer to the question about the welfare loss associated with the closure of the library service (both of the respective commune and at a national level) indicates that users' valuation should be greater. It is also noted that none of the three groups shared the same view on the possibility that libraries should be funded only by those who use the services they deliver; even non-users assign a score of 2.49 to this question (on a scale from 1 to 10, with 1 being "strongly disagree"), which, although it is slightly higher than the score assigned by users is still very low.

Table 6
Average agreement on the following statements
(Being 1 "strongly disagree" and 10 "strongly agree")

		Users	Resident Users	Non-user residents
1	Libraries are very important to local communities.	9.7	9.6	9.4
2	Libraries are very important to me.	9.3	9.0	7.7
3	I would experience a personal loss if the public library of my commune ceased to exist.	8.9	8.3	6.6
4	I would experience a personal loss if the public libraries in Chile ceased to exist.	9.2	9.0	7.9
5	The cost of maintaining libraries should be paid only by those who attend them.	2.5	2.6	2.5

Notes to Table 6: We conducted a test of mean differences in the answers for each of these questions and the results show that: (i) the average agreement of users and residential users are statistically higher than those of nonusers; (ii) user valuation is statistically greater than the resident users, except in the case of questions 4 and 5; and (iii) the last question is not statistically different between the 3 groups.

Other results that are not reported in detail²⁵ indicate that:

²⁴ 32% of the first group declares that they go at least once a month to a library, while only 27% of the second group claims to do so.

²⁵ These may be requested from the authors.

- Users would be willing to offer to work between 5.8 and 5.9 hours per week in libraries as volunteers, giving a total of 23 hours per month which, given the number of people willing to volunteer, would mean libraries would be able to count on having about 20,000 hours of volunteer work per month. This is a very interesting and surprising result; in fact, just as the WTP indicates that it is possible to seek additional income for a library (backed by citizens' preferences) this result indicates that it is possible to reduce the costs of operating a public library. A management model that considers the participation of residents in the management seems to be an option worth exploring.
- Most participants (who declare a positive willingness to pay) prefer to allocate contributions to build new libraries, rather than to improve library services they visit, which could be a reflection of a value linked to existence and altruism (components of non-use value). This is valid for both users and non-users. Of course, the quality of the library facilities varies considerably, and it would be useful to further explore the age and modernity of the library best known to these respondents.
- Between 40% and 45% of users prefer that the additional contributions be administered by each library and only 10% said they would rather the administration be done by a public agency for all public libraries. This is potentially significant if one wishes to extend the results of this study to a broader cost-benefit analysis of specific strategies in line with Báez and Herrero (2012).

Regression results

Table 7 reports the regression results for users and residents, and Table 8 shows the results for resident users and non-users. The dependent variable is defined as the probability of an affirmative answer to the question of willingness to pay (with Question 1 identifying a lower peso amount of contributions than Question 2), or in other words, the probability that the WTP (unobservable) is greater than the contribution amount being identified.²⁶ We see that:

- As is expected, the coefficients associated with the amount of the first and second questions are negative: the greater the amount being asked to contribute, the lower the probability that the answer is *yes* and therefore the percentage of the sample that is willing to contribute is also less. Conversely, when the amount being asked for is less, the willingness to contribute is greater.

- The coefficients of the WTP for the initial question and the second question are also significant at 99%, i.e., the probability that both coefficients are null from a statistical point of view is less than 1%. This, however, is not true for non-users,

²⁶ The first question language is: "Would you be willing to make a monthly contribution of X pesos?" If the answer is yes, the second question is: "Would you be willing to make a monthly contribution of Y pesos?" where $Y > X$. If the answer to question one was no, the second question substitutes an amount Z pesos, where $Z < X$.

whose willingness to pay does not seem sensitive to changes in the amount being asked for (in fact in this group, the coefficient for the second question does not even reach a 90% level of statistical confidence).

- The monetary household income shows a positive impact on the willingness to pay although it is not statistically significant in all specifications.

- The gender variable reveals a positive impact on the results although not statistically significant

- There are intriguing results regarding age, with older age having a strongly statistically significant negative effect on willingness to pay among users, but a modestly positive effect among residents. The reasons for this result are unclear.

Table 7
. Econometric results
(Users vs. residents)

	Users		Residents	
Question 1	-9.84e-05***		- 0.000128***	
Question 2	-9.99e-05***		-6.54e-05***	
Gender	0.152	0.190	0.00343	-0.00288
Age	-0.00845**	-0.0118***	0.000284**	0.000109
Income	0.000333*	0.000397**	0.153	0.0912
Constant	0.583**	0.732***	0.420*	0.135
N	444	444	460	460

Robust standard errors (controlling for heteroscedasticity)

* Significant at a 90% confidence interval

** Significant at a 95% confidence interval

*** Significant at a 99% confidence interval

Table 8
Econometric results
(Resident users and non-user residents)

	Resident users		Non-user residents	
Quest 1	-0.000118***		-0.000149***	
Quest 2	-5.54e-05**		-9.12e-05***	
Gender	0.125	0.0377	0.184	0.107
Age	0.00995	-0.00667	-0.00340	0.00113
Income	0.000820***	0.000210	-1.87e-05	0.000226
Constant	0.119	0.303	0.758**	0.0458
N	183	183	217	217

Robust standard errors (controlling for heteroscedasticity)

* Significant at a 90% confidence interval

** Significant at a 95% confidence interval

*** Significant at a 99% confidence interval

The following Table 9 summarizes the results for magnitudes of WTP, distinguishing among three groups (users, resident users and non-users residents) and also showing the lower and upper limits of its confidence interval²⁷. The mean values of users move between 4,649 and 5,799 Chilean pesos monthly.

Table 9
Average WTP and confidence interval (monthly Chilean pesos)

	Lower limit	Average	Upper limit
Users	2,649	4,649	6,095
Residents	4,796	6,006	7,030
<i>Resident Users</i>	6,545	8,257	10,268
<i>Non- user residents</i>	2,632	4,703	6,095

We see that the average value that users are willing to contribute is less than the average amount residents are willing to contribute. This may be partly explained by the fact that residents have a higher median income (which, according to the results in Tables 4 and 7 and other studies, determines a greater WTP). This result can also be explained by the fact that users know with certainty how much they value library services while non-user residents have a more vague idea of how much they value these services, having responded based on an "idea" of what they "should answer" or what the service "should cost,"²⁸ which influences the aggregate result of residents.

We ran a number of other tests to explore several supplemental hypotheses. The results (non-reported but available upon request), indicate that:

- Considering only those respondents who, in addition to declaring they are willing to contribute to maintain library services also have a medium or medium high certainty regarding their willingness to pay, the WTP remains higher for non-users residents, although the difference is smaller²⁹.
- If we estimate the WTP imposing the same level of income upon both groups, hence allowing us to eliminate the influence that this variable would have on the WTP gap between the two groups, the difference becomes smaller but is still positive.
- Another result indicates that there is a positive correlation between the probability of an affirmative answer to both questions (varying in peso amounts) and the evaluation of the quality of service (particularly in terms of the assistance provided

²⁷ The average willingness to pay by non-users is less than that of the first two groups (which makes sense because they have no use-value). However, it is observed that the lower end value is very negative and the upper limit value is very high, indicating that this estimate is not reliable (significant) from a statistical point of view.

²⁸ These are hypotheses that we cannot confirm but have already been highlighted in literature (see e.g., Seaman, 2006).

²⁹ The average certainty score (about WTP) is 7.37 in the case of users and 6.83 in the case of non-users.

by the librarian and staff). This is encouraging inasmuch as the greater the perception of the quality of service the greater the willingness to pay. This is potentially relevant from the point of view of the management strategy of libraries. However since it is only a correlation, this finding must be viewed with caution.

Certainly we believe it is necessary to identify more closely the determinants of any valuation gap among residents, users and non-users. Research regarding those determinants could potentially find a relationship between the importance of the services provided by libraries and the perceived threat posed by the patterns of inequality in Chilean society. For example, it is highly likely (and our demographic results are suggestive) that those who visit libraries are different from those who do not visit them in terms of opportunities and broader socioeconomic variables. These differences would naturally create a greater perceived need for libraries among those with less income, education and/or access to goods and services that may substitute for libraries (e.g., access to information services on the web, at universities or jobs, books available online, and having an active social life in other spaces) and in turn reinforce certain important components of the non-use value of non-users. For example, non-users who are relatively well-off may recognize the unique role played by community libraries in mitigating the unequal access to vital sources of information and social outlets provided by libraries, and hence exhibit a social concern for those who have fewer opportunities that translates directly into higher willingness-to-pay values.

These estimates of WTP could be used as a price indicator to build a social demand function regarding the network of libraries reflecting society's WTP for these services. We omit this explicit analysis here since it was not part of the original objective of this research but that extension would be part of a broader cost-benefit analysis in line with the work of Báez and Herrero (2012). It is also important to note that this measurement of social value does not necessarily take into account a number of related explicit benefits linked to education, research and social cohesion associated with the use of library services, although such considerations could be part of the WTP values expressed by all three subgroups. A more explicit effort to identify the sources of especially the non-use values might suggest that further information about those aspects of library usage would increase the WTP values. It would also be interesting to try to combine this method with other valuation approaches such as travel and related cost approaches, or economic impact spending flow considerations in order to obtain a more complete measure of the economic, cultural and social impact of public libraries in Chile (see Alberini and Longo, 2006; Seaman, 2006).

9. Conclusions and recommendations

The contingent valuation method has gained much popularity in the evaluation of the social benefits that provide a wide range of public or quasi-public goods and services. In this paper we have described this methodology, given examples of how it has been applied in a number of countries to estimate the social benefits of public libraries and then applied it to the study of the Network of Public Libraries in Chile.

Guided by insights from the literature we have created surveys that were used in the pilot phase of fieldwork. We have also described the method used to select a sample of users (interviewed in libraries), a sample of residents (interviewed outside of libraries), as well as the final version of the surveys that were applied to the entire sample (on a national level).

We have also developed and explained an econometric model and the methodology used to estimate them in order to calculate the willingness to pay (WTP) of citizens (both users and non-users) for the services delivered by the network of public libraries. In estimating this model we have also been able to determine the influence that different factors have on the WTP.

The results indicate that people exposed to a hypothetical situation in which they would have to pay to maintain libraries in order to avoid their closure (and hence, the end of the services they deliver) would be willing to do so (or volunteer to contribute working hours to their management). Although this is an extreme case scenario, it illustrates some things related to the welfare that users and non-users derive of the services delivered by the National Network of Public Libraries in Chile.

The results are consistent with economic theory and other studies. For example, it appears that monetary income has a positive and statistically significant effect on the WTP of a person. Also, if we control for payment security - restricting estimates to individuals who claim to be fairly or very confident that they could contribute the amount declared - the WTP is slightly lower.

This measurement of social value can be used to conduct a cost-benefit analysis in the future although it is important to note that it does not necessarily reveal a number of additional benefits, such as those related explicitly to education, research and social cohesion, and hence might represent a lower bound value. Therefore, it would be useful to combine this method with others, in order to obtain a more complete measurement of the economic, cultural and social impact of public libraries. Also as noted in the Introduction, this is a social program clearly designed to generate not just the highest possible net social benefits, but to redistribute economic opportunity to target populations that are poor and relatively isolated. The fuller analysis of how to weight such benefits and costs is part of the ongoing research agenda.

There are four main results:

(i) Fairly high proportions of both users (52%) and non-users (48%) are willing to make a monetary contribution (which is statistically significant) to maintain the network of libraries, with the highest proportion (56%) being “resident users,” i.e. those who qualify as users only by meeting the fairly weak test of claiming to have visited a library at least once within the previous twelve months. Women are also overrepresented among those willing to make contributions, ranging from 56% of female users to 60% of female resident users, with 59% of both overall female residents and female resident non-users being willing to pay something.

(ii) The average value users are willing to contribute (about \$7.75 per month U.S) is less than the value residents are willing to contribute (about \$10 per month U.S.), whether those residents are users or non-users. However, this difference is especially pronounced for resident users (those whose direct use is likely to be infrequent compared to users), being an average of \$13.76 U.S. per month. Non-user residents and users (those interviewed directly in libraries and likely to be more frequent users) report very similar results, although the average monthly contribution of users of \$7.75 (U.S.) is modestly lower than that of non-users (\$7.84 U.S.).

(iii) Any difference in WTP is less when we consider only those people interviewed who, in addition to declaring their willingness to contribute, have a medium to high level of certainty regarding their level of provision, and when we impute the same level of income to both groups. Both of those results are consistent with economic theory.

(iv) Among those who are not willing to make a monetary contribution, many people would be willing to contribute time to voluntarily work to manage local libraries, which is an interesting result from the point of view of the possibility of reducing the provision costs of providing this service, as well as the costs of participating in the varied activities at these locations for the local community.

Regarding the second result, it is possible that the valuation gap is explained largely by the fact that users interviewed in libraries and non-user residents, and more importantly resident users who are likely to be infrequent direct users of libraries are different in terms of opportunities and other socioeconomic characteristics. Many Chileans do not have internet service in their homes, and rely on either neighborhood internet cafés for a fee (often a simple room attached to a modest local grocery store or even a private home), or free community libraries, which also serve as a repository for books and other reading materials and as a kind of community center. Those who are less likely to visit such libraries are probably better off than their neighbors within a given community, and libraries in more upper income neighborhoods (even if having more services) would certainly not be used as fundamental substitutes for basic digital information access available in homes or offices. This could be addressed in future research in order to generate useful information on the local utility of libraries to reduce socioeconomic inequalities and the existing inequality of opportunities in Chile, especially in educational access. Educational access is a problem that has presented huge political challenges for both recent center-right and center-left national governments, including having to cope with large, persistent and sometimes violent street demonstrations. Research on this issue could connect the importance of the services provided by libraries with patterns of inequality.

For example, it is important to confirm our suspicion that those who visit libraries are different from those who do not, in terms of opportunities and socioeconomic variables. And although these differences could determine a greater need for libraries among those with less income, education and/or access to substitutes for a library (access to information services on the web, at universities, online purchase of books, and having a social life in other spaces), they also have a lower ability to pay for such services that translates into lower WTP results compared to those with lower “direct benefits” from community libraries, but who recognize the potentially critical role of those facilities in mitigating the

inequalities that are plaguing Chilean society, despite the overall relative strength of that economy.

It would be important to analyze these hypotheses in future research, since Chile is a country, despite being the only South American country in the OECD (admitted in 2010 along with Estonia and Israel), with deep socioeconomic inequalities that are hardly unique in South America and many other parts of the world. Specific questions for future research would be: (i) are libraries beneficial for its users in terms of some broader welfare measures and access to opportunities, including access to employment and higher educational options?; (ii) are users mainly people from lower socioeconomic or educational levels or with fewer opportunities linked to other variables?; (iii) do non-users have a greater WTP, not only because of their greater income, but because to them the existence value, value of heritage, value of altruism, or even the perceived value of reduced social discord is greater? That is, we want to confirm our suspicion that at least part of this valuation gap can be explained by the existence of a greater social concern by non-users for those who have fewer opportunities, which would be reflected in their higher non-use values in the forms of altruistic value and other values, including the more self-interested value of stabilizing their local and national society. In fact, distinguishing between concern for others and the quite understandable personal concern that social tensions in society be reduced is an especially noteworthy objective.

It would also be valuable to extend this research to analyze potential network effects (where the WTP is a positive function of the number of users). This is particularly important in the case of community libraries, where their function includes serving as community centers. Unfortunately, we did not have reliable data accounting for the visits to each library, but it is information that the SNBP is currently developing.

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