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Willingness to Pay for the Rural Telephone Service in Bangladesh and Peru

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Abstract

This paper measures the rural households' willingness to pay (WTP) for access to public telephone services in Bangladesh and Peru through contingent valuation methods. The development of contingent valuation methods together with the econometric expansion of qualitative response models has permitted an approximation to the consumer surplus in the presence of externalities, public good and information asymmetries. The paper utilizes both parametric and nonparametric estimations that are commonly observed in the literature concerned with the estimation of WTP. The main result of the paper suggest that rural telecommunications projects are welfare enhancing, since households' WTP are higher than the prevailing tariff rates. For Peru, households' currently pay US$0.14 for local calls and US$ 0.29 for national long distance calls (LDN), while their WTP for a local call varies from US$0.25 to US$0.35, and for a LDN call varies from US$0.33 to US$0.45. For Bangladesh, households' WTP for a local call varies from US$0.10 to US$0.26, for a LDN call from US$0.23 to US$0.50, and for an international call from US$0.93 to US$1.35. Meanwhile, they are currently paying US$ 0.03, US$ 0.06 and US$ 0.46 respectively. Despite the fact that the monetary measures of WTP vary depending on measurement methods, the results are consistent for all the parametric and non-parametric measures utilized suggesting that the rural telecommunications projects in Bangladesh and Peru are directly contributing to the improvement of welfare of rural households.

Kurzfassung

In dieser Studie wird die Zahlungsbereitschaft (Willingness to Pay) ländlicher Haushalte für den Zugang zu öffentlichen Telefondiensten in Bangladesh und Peru mit Hilfe der „contingent valuation method“ ermittelt. Die Entwicklung der „contingent valuation method“ und die ökonometrische Ausweitung des „qualitative response models“ haben eine Annäherung an die Konsumentenrente unter Einbeziehung von Externalitäten und assymetrischem Zugang zu öffentlichen Gütern und Informationen ermöglicht. In der Studie werden parametrische und nicht-parametrische Schätzungen angewendet, die man auch in der Literatur zur Schätzung der Zahlungsbereitschaft finden kann. Das Hauptergebnis der Studie zeigt, dass lokale Telekommunikationsprojekte das Gemeinwohl erhöhen, da die Zahlungsbereitschaft der Haushalte über den gängigen Tarifen liegt. In Peru zahlen Haushalte zur Zeit US$ 0.14 für regionale Telefongespräche und US$ 0.29 für Ferngespräche im Inland (LDN). Die Zahlungsbereitschaft für Ortsgespräche liegt aber zwischen US$ 0.25 und US$ 0.35, und die für inländische Ferngespräche zwischen US$ 0.33 und US$ 0.45. In Bangladesh liegt die Zahlungsbereitschaft für Ortsgespräche zwischen US$ 0.10 und US$ 0.26, für inländische Ferngespräche zwischen US$ 0.23 und US$ 0.50 und für Auslandsferngespräche zwischen US$ 0.93 und US$ 1.35. Bezahlen müssen die Haushalte dort zur Zeit aber nur US$ 0.03, US$ 0.06 beziehungsweise US$ 0.46. Trotz der Tatsache, dass monetäre Messungen der Zahlungsbereitschaft je nach Messmethode variieren, sind die Ergebnisse für alle parametrischen und nicht-parametrischen Messungen konsistent. Dies deutet an, dass die ländlichen Telekommunikationsprojekte direkt zur Verbesserung des Gemeinwohls der ländlichen Haushalte beitragen.

1 Introduction

The primary objective of universal service[1] or universal access[2] when dealing with telecommunications in developing countries is to 'break the isolation of communities and households living in rural and remote areas' by bringing the households in to a basic communication network. In order to achieve universal access, among another goals, a wave of reforms has affected telecom operators in developing countries. Reforms comprised privatization, the introduction of regulatory authorities and fostering competition when possible.

However, even in those countries that have successfully reformed their telecom sector, there is a limit on relying in private investment to extend telecom coverage. It is very unlikely that any private investor will engage in any very risky or unprofitable venture without being compensated. The traditional explanation for lack of universal access has to do with the lack of funds from rural poor people to afford the service. As a response several subsidy mechanisms have been implemented trying to assure that poor people will pay the same for telecom access that better off people in urban areas where implementing the service is cheaper. The main problem with those schemes has been its sustainability. However, as we will review later on, in some experiences rural inhabitants are willing to pay much more that urban consumers for telecom services and these schemes are more sustainable over time. If that's the case the lack of resources is not the only valid argument to support subsidy schemes. In fact several authors have challenged the fact that it is "unprofitable" to provide rural telecom services and they blame regulatory agencies for their lack of ability to correctly estimate the willingness to pay of rural inhabitants (see Richardson, 2002). This somehow corresponds with the subsidy requirements made by private rural operators in tender process, which usually have been much lower than anticipated. Probably lack of (or asymmetries in) information or the need of seed money to reduce the risk of establishing a network, are better arguments to substantiate the need for initially subsiding private rural operators.

[1] Universal Service is based on the fundamental principle of "the right of every inhabitant to access at least the basic telecommunication service". In that sense, the Universal Service aimed at providing telecommunications services to all individual residences, including those in rural, remote and high cost locations. The Universal Service reduces the isolation of the rural communities and decrease the migration to the cities. Also, contributes to a better education and provides access to the information systems.

[2] In some contexts, the Universal Services becomes an expensive and unpractical goal. Universal Access is a more realistic goal in most developing countries. It based on distribution equity, mayor geographic cover, and physical material equality (the service must be accessible to disabled people). Universal Access policies work to increase access to telecommunications services on a shared basis. Therefore, the Universal Access policy can defined as "the existence of at least one basic service of telecommunication in a community with a minimum number of inhabitants". Typically, the policy promotes the installation of one public payphone or public call offices in a rural or remote village to provide basic connection to the telecommunication network.

This paper also tries to test the idea that the willingness to pay is higher in rural areas as a way of giving additional information to help design more self-sustained schemes to reach universal access. Specifically, the paper measures the rural households' willingness to pay for access to public telephone services in Bangladesh and Peru through contingent valuation methods. The development of contingent valuation methods together with the econometric expansion of qualitative response models has permitted an approximation to the consumer surplus in the presence of externalities, public good and information asymmetries. This approximation can be made by the simulation of hypothetical markets that allow the seizure of what will be called the willingness to pay (WTP).[3]

Peru and Bangladesh have both similarities and differences that make the comparison an interesting one. In terms of similarities both Bangladesh and Peru are characterized by under provision of telephone networks for households living in rural areas despite the fact that both countries have a competitive rural telecom market. Coincidently, both Bangladesh and Peru currently contain two examples that are considered as two best practices in rural telecommunications provision.[4] In terms of differences, one can identify three major ones. First, though recent developments in both countries are enabling rural communities to have limited access to telecommunications services, differences exist in the provision mechanism. While in Peru it is through regulation and private sector participation, in Bangladesh a business non-profit partnership is providing telecommunications services to people living in rural areas. The second difference is in terms of technology. While in Peru it is fixed telephony (public fix phones), in Bangladesh it is mobile phones. The third difference comes from the difference in geography. While with the exception of the eastern part Bangladesh has a flat terrain, Peru is characterized by the presence of mountains and difficult terrains that make the establishment of any network a complicated one.

We use both parametric and non-parametric approximations that are observed in contingent valuation literature for the distribution and estimation of the WTP to have an exhaustive sensitivity analysis of the results obtained. In the development of the parametric approximation it will make use of two alternatives. [5] First, it will estimate a logit model, and with the resulting parameters it will proceed with the estimation of different central tendency measures of the willingness to pay. Second, it will estimate a bounded probit model that includes limits to the willingness to pay, and with the resulting parameters it will estimate the central tendency measures of willingness to pay. For non-parametric estimation, it will estimate WTP willingness to pay based on two methods: Turnbull algorithm, and Kriström's nonparametric method.

[3] See Hanemann (1984); McFadden (1994); Maddala (1983). An extensive literature has investigated the use of the contingent valuation method to value the environmental good. For instance, see Bowker and Stoll (1988), Cameron and Huppert (1991), Cameron and James (1987) and the references in McFadden (1994).

[4] See Bayes et al (1999) for Bangladesh and Cannok (2001) for Peru.

[5] The study estimates both parametric and non-parametric measures. The purpose is to avoid the problems stated by Duffield and Patterson (1991); they pointed out that the estimated willingness to pay value might be very influenced by the parametric or non-parametric methodology used.

Our results shows that although the results are sensitive to specification and methodology it does seem that rural populations in both countries are willing to pay a higher amount for telephone services than they are currently paying. This is consistent with the multiple benefits that rural households obtain with the access to a public telephone service both in Bangladesh and in Peru. Among the main benefits that have been identified in the survey are: contact with relatives, possibility of purchases or sales, information of prices of agriculture products, knowledge of the market situation before the delivery of the product to the city, contact with carriers, attention of health emergencies, etc. In effect, information technology access generates externalities that might dynamize the economy of rural households, thus reducing poverty levels and increasing welfare. Finally, we belief, these central tendency measures, parametric and nonparametric, may be used in the profit/cost analysis of the rural telephone project.

2 The Use of Willingness to Pay

Willingness to pay is the maximum sum of money (assuming money as the numeraire good) the individual would be willing to pay rather than do without an increase in some good such as access to rural telephone services. This sum is the amount of money that would make the individual indifferent between paying for and having the access to phone and not having access while keeping the money to spend in other goods. Willingness to pay takes as reference point the absence of the specific good (i.e. telephones in our specific case) and therefore without markets and prices there is a need to fall back on various indirect methods of calculating it. In this sense, through the recreation of hypothetical markets, information about consumer preferences can be obtained from free-response questions or using bounded-response questions. Free-response has not been commonly used in contingent valuation literature[6]. On the other hand, there is a current consensus in the usage of the bounded-response questions in contingent valuation surveys. Bounded response can be classified in a simple referendum where a simple offer is made, or in a double referendum where a second offer is made conditioned to the response given to the first offer.

One of the most popular survey designs to select the willingness to pay is the dichotomous choice (simple referendum). In this particular case, respondents to the survey are asked whether they are determined to pay a certain amount of money. The question is simple and easy to answer. However, it supplies a limited quantity of information. In this perspective, a sequential referendum would increase the valuation efficiency but at the expense of a greater difficulty in the estimation of the distribution and also endogeneity in the follow up question .[7]

The analysis frequently observed in the literature of contingent valuation emphasizes the conditional analysis of the willingness to pay, where one of the main interests is to analyse the conditional relation of willingness to pay and the vector of covariants (X), which describes the consumer characteristics. McFadden (1994) shows that, when necessary, auxiliary information is available to re-weight the sample then there is a gain in statistical efficiency of a conditional approximation. This result does not require the covariants to be free of measurement errors or the conditional mean of the WTP to be linear in X, because errors simply contribute to the non-conditional variance. However, he warns that the conditional approximation is not robust to inconsistencies between sample data and auxiliary distributions of covariants, such as mean differences due to changes in the phraseology of the question, codification or the period of data collection.

[6] The option of open response has relatively a high incidence of no answer or “protest” answer.
[7] See Hanemann (1984); McFadden (1994); Haab and McConell (1997)

The estimation of the distribution of the WTP is tackled in the literature through parametric or non-parametric approximations.[8] The parametric approximation, widely used in the contingent valuation analysis, specifies a parametric model in which a relation between the WTP and the consumer intrinsic characteristics is stated. The non-parametric approximation estimates the distribution of the WTP without assuming any parametric specification of the preferences distribution. Both approximations have advantages and disadvantages. The parametric approximation is susceptible of misspecification errors, being the estimation sensible to the parametric family that contains the distribution of the WTP. The parametric distributions family considered frequently in literature includes logistic, loglogistic, normal, lognormal, bounded normal, bounded logistic and Weibull distributions. On the other side, the non-parametric approximation does not permit a conditional analysis.[9]

The main advantages of the parametric method are that it makes it relatively easy to impose preferences axioms, combines experiments and, primarily, allows one to extrapolate the calculation to different populations without constraining exclusively to the sampled population. On the other hand, the main limitation is that if the parametratization is not flexible enough to describe the behaviour, then the incorrect specification might give inconsistent estimations of the real WTP. Specifically, the estimated mean is highly sensible to the assumption made about the parametric family, which contains the distribution of the WTP.[10]

In the development of referendum models there are two stages that need to be differentiated: first, the parameter estimation stage, and second, the mean willingness to pay calculation stage. Despite the wide diffusion of referendum models, some problems persist in the calculation of the measures of WTP from the estimated parameters. One of the problems arises when the mean willingness to pay is negative. In this case, one possible parametric solution consists in the assumption of a distribution defined strictly for positive values (Lognormal or Weibull) or the assumption of a distribution defined for positive and negative values and the bounding of the estimation of the expected willingness to pay (Bounded Normal or Bounded Logistic). Another possible solution, non-parametric in this case, implies the use of an empirical distribution function based in the proportions of negative responses to each specified offer (Turnbull Approximation).

In this perspective Haab and McConell (1997) explore these tentative solutions and find that models with bounded distributions or distributions defined strictly for positive values tend to produce lower estimations of the mean of the WTP. This fact by itself is not a problem. However, when the range of the willingness to pay that varies between zero and infinite is considered, the estimated means are biased toward higher values[11]. On the other hand, the use of the Turnbull approximation does not permit a simple estimation of the covariants effects over the

[8] See Hanemann and Kanninen (1999) for a comprehensive review of the statistical methods.
[9] See An (2000) on this point.
[10] See McFadden (1994).

mean willingness to pay. Therefore, if the objective of the study is to measure or contrast some effects of the characteristics of consumers over the mean willingness to pay, the parametric approximation is convenient. In comparison, if the objective is the estimation of the mean of the willingness to pay, the non-parametric approximation is adequate.

[11] In respect to this last point, recent research has incorporated an upper bound to the willingness to pay defined by the income of the person.

3 Modelling the Willingness to Pay

3.1 Theoretical Model

It is assumed that the households interviewed answer the contingent valuation questions based on the utility that it represents for them from consumption of rural telephone services. The household utility is defined as a function that depends on the consumption of a compound good Z and on the consumption of rural telephone services, TR, given by:

(1) $U = U(Z, TR) \qquad U_Z > 0 \qquad \text{and} \quad U_{TR} > 0$

In this case the utility is increasing in Z and TR. Solving the consumer problem, one can obtain the indirect utility of an individual who consumes a rural telephone service given by:

(2) $V_1 = V_1(Y - WTP | TR > 0, X, \boldsymbol{e})$

where Y is the household income, WTP is a money amount that makes TR not zero, X is a vector of the household's observable characteristics and ε is a vector of non-observable characteristics. Therefore, the optimal willingness to pay by the household is WTP* which makes the following indirect utility functions equivalent[12]:

(3) $V_0(Y | TR = 0, X, \boldsymbol{e}) = V_1(Y - WTP^* | TR > 0, X, \boldsymbol{e})$

Then, assuming that $V_1(\lambda, p \,|TR>0, X, \varepsilon)$ is increasing in λ, there exists an inverse function $\psi(\nu, X, \varepsilon)$ which makes $\psi(V_1(\lambda, p|\ TR>0, X, \varepsilon),\ X, \varepsilon)=\lambda$. Therefore, the willingness to pay can be expressed as:

(4) $WTP^* = Y - \Psi(V_0(Y | TR = 0, X, \boldsymbol{e}), X, \boldsymbol{e}) \equiv WTP^*(Y, X, \boldsymbol{e})$

This definition of the willingness to pay has some interesting implications and one of them is that being ε a non-observable variable, WTP is a random variable which has a conditional distribution of the individual characteristics that depends of the distribution followed by ε.

[12] The stability of the individual preferences is assumed. This is the fundamental assumption of the welfare theory of Hicks.

3.2 Parametric Approximations

3.2.1 Logit Model

The parametric estimation of WTP using a logit model consists of the following stages:

Estimation of a logit model,[13] with a dependent variable with a value of 1 if the offer (bid) was accepted and 0 if it was not. The explanatory variables include the value of the bid and socio-economic characteristics of households.

Formally, the idea is that the respondent has to answer whether he is willing to pay for a change in access to the telephone from 0 to TR if it costs \$B. If one assumes that the indirect utility function is V(Y,TR.X) where X is a vector of individual characteristics,[14] then the answer would be an affirmation if:

$$(5) \qquad V(Y-B,TR,X)-V(Y,X)\geq 0$$

and a negative one if to the contrary. In this way, following Cameron and James (1987) and Bowker and Stoll (1988), a logistic model can be used. The probability of an affirmative response to a bid of \$B when the consumer has a vector X of explanatory variables is given by:

$$(6) \qquad P(yes/x)=\frac{e^{b'X}}{1+e^{b'X}}$$

Once the logit model has been estimated, Hanemann (1984,1989), Ardilla (1993) and Vaughan, et. al (1999) propose some measures of willingness to pay for the non-constrained mean, median, and bounded mean which constrains the WTP to positive values (detailed in table-1). According to their usage in previous research, all of these measures are equally legitimate. For example, the non-bounded median of the logit estimation has been one of the most popular ones, in spite of its potential problem of negative values for the WTP. The present study considers all of the measures and shows the results for each of them.

Table-1 shows the different central tendency measures for the probability model. Letter C in Table 1 is an abbreviation to identify the measure of the central tendency of the WTP, following the notation used by Hanemann (1984,1989). The term is called augmented intercept and is equivalent to the intercept coefficient of the model plus the other estimated parameters

[13] In literature, logit and probit are frequently used, but McFadden (1994) shows that there are other possibilities in which the Gamma and Weibull distribution can be used. The logit's advantage is that its closed shape is easier to operate mathematically in comparison with other distributions. Moreover, as mentioned in Maddala (1983), despite that the logit distribution has longer tales than the normal distribution (used in probit), both models produce similar predictions of elasticities and probabilities.

[14] The vector of market prices (P) is not included because it is assumed that they are constant.

(i=1…n) -except the bid parameter (β)-, multiplied by the sample mean of the explanatory variables ($\overline{X}_i$).

Table-1: Central Tendency Measure Formulas for the Logit Model

Description	Symbol	Formula
Mean, E(WTP), -∝<WTP<∝	C^{+}	á/â
Median WTP	C^{*}	á/â
Truncated Mean, E(WTP), 0<WTP<∝	$C^{'}$	ln(1+exp(á))/â
Truncated Mean, E(WTP), 0<WTP<B_{max}	$C^{\sim}$	1/ â ln[(1+exp(á))/(1+exp(á-âB_{max}))]

Note: B_{max} is the maximum bid; The measures with bid logarithmic transformation were not applied because the results were not consistent with the selected bid ranks.

3.2.2 Bounded Probit Model

Following Haab and McConell (1997), it is assumed that the willingness to pay for rural telephone services comprises a range that varies from zero to an amount, A, which might be the total income or a fraction of it. Then, assuming that $\varepsilon \sim N(0,\sigma^2)$, WTP* is defined as a stochastic function of the vector of characteristics which considers constraints imposed beforehand. This can be written as:

$$(7) \qquad WTP = \frac{A_i}{1+e^{X_i b+e}}$$

Considering that the respondents interviewed answered the question "...are you willing to pay the amount of t for the rural public telephone service?", one can model the probability response of each respondent as:

$$(8) \qquad P(WTP_i^* \le t) = P\left(\frac{A_i}{1+e^{X_i b+e_i}} \le t\right) = P\left(\frac{e_i}{s} \le \frac{X_i b - \ln\left(\frac{A_i - t}{t}\right)}{s}\right)$$

Next, the logarithmic likelihood function for the case of a probit model is:

$$(9) \qquad \ln(L) = \sum_{i=1}^{n} (1-\boldsymbol{p}_i)\Phi\left(\frac{\boldsymbol{e}_i}{\boldsymbol{s}} \le \frac{X_i\boldsymbol{b} - \ln\left(\frac{A_i - t}{t}\right)}{\boldsymbol{s}}\right) + \boldsymbol{p}_i\left(1 - \Phi\left(\frac{\boldsymbol{e}_i}{\boldsymbol{s}} \le \frac{X_i\boldsymbol{b} - \ln\left(\frac{A_i - t}{t}\right)}{\boldsymbol{s}}\right)\right)$$

where $\boldsymbol{p}_i = 1$, if *i*th respondent says yes to the question and 0 otherwise. In this case the parameters to be estimated by an ordinary probit are $\frac{b}{s}$, linked to X regressor, and $\frac{1}{s}$ associated to regressor $-\ln\left(\frac{A_i - t}{t}\right)$. One can recover β coefficients, present in the willingness to pay function WTP*, through a simple division of these estimated coefficients. The interest in recovering β coefficients lies in the fact that the median and marginal effects appear to be a function of those coefficients.

3.3 Non-Parametric Approximations

To avoid the potential problems of parametric measures, and instead of bounding the WTP to zero, or to a upper limit or both, Haab and McConell (1995,1997) propose non-parametric alternatives to obtain lower limits of the WTP mean and median. The two measures that these authors suggest are Turnbull and Kriström.

3.3.1 Turnbull Non-Parametric Measure

According to Vaughan, et al (1999) if the bid is b_j, j=0,1,…M+1, $b_j > b_k$ for j>k, b_0=0 and the probability of the respondent interviewed WTP lies between the interval b_{j-1} and b_j, then:

$$(10) \qquad p_j = P(b_{j-1} < WTP \le b_j) \text{ for j} = 1,..., \text{M} + 1$$

Also, if the cumulative distribution function is:

$$(11) \qquad F_j = P(w \le b_j) \text{ para j} = 1,...\text{M}+1, \text{donde} F_{M+1} = 1$$

Then:

$$(12) \qquad p_j = F_j - F_{j-1}$$

and F_0 is equivalent to 0.

Therefore, all the probabilities can be estimated in the following way:

Let N_j and Y_j represent the number of "no" and "yes" responses respectively, registered in every *bid*[15] interval.

If $[N_j/(N_j+Y_j)]>[N_{j-1}/(N_{j-1}+Y_{j-1})]$ for all j is between 1 and M, then:
$p_j=[N_j/(N_j+Y_j)]-[N_{j-1}/N_{j-1}+Y_{j-1})]$

The probability $N_j/(N_j+Y_j)$ represents the proportion of people interviewed that said "no" to the *bid* b_j, so they are a natural estimator of F_j.

Then, the estimator of p_j would be:

(13) $$p_j = F_j - F_{j-1}, \text{ where, } F_j = \frac{N_j}{N_j + Y_j}$$

And the expected WTP would be:

(14) $$E(WTP) = \int_0^{\infty} WTP dF(WTP) = \sum_{j=1}^{M+1} \int_{b_{j-1}}^{b_j} WTP dF(WTP)$$

Replacing the WTP by the lower limit of each interval, an estimation of the lower limit (LB) of the WTP is obtained:[16]

(15) $$E(LB_{WTP}) = 0 \cdot P(0 \le w < b_1) + b_1 P(b_1 \le w < b_2) + ... + b_m P(b_m \le w < b_{m+1}) = \sum_{j=1}^{M+1} b_{j-1} p_j$$

Where $p_{M+1} = 1 - F_M$

Finally, the lower limit estimation variance would be:

(16) $$V\left(\sum_{j=1}^{M+1} b_{j-1} p_j\right) = \sum_{j=1}^{M+1} b_{j-1}^2 (V(F_j) + V(F_{j-1}) - 2\sum_{j=1}^{M+1} b_{j-1} \sqrt{V(F_j)} \sqrt{V(F_{j-1})}$$

Where, $V(F_j) = \frac{F_j(1-F_j)}{(N_j + Y_j)}$

[15] To proceed with the calculus the observations were grouped in tariff ranges, therefore the percentage of negative responses will increase according to higher ranges.
[16] See Vaughan et al (1999) for a more complete explanation.

It is important to mention that the b_M used in the calculation is the maximum offered bid and is the lower limit of the last interval that goes from b_M to infinity, and this is what determines the condition of estimation.

3.3.2 Kriström Non-Parametric Measure

Kriström's (1990) non-parametric method consists of grouping the frequency of the "yes" responses to the bid range in a monotonically decreasing order with increasing bid ranges. Next, the points are connected by linear interpolation. To obtain the mean of the WTP the integral below the cumulative density function is approximated as shown in the following equation:

$$(17) \qquad E(x) \text{ in the interval } x_2 - x_1 = \int_{x_1}^{x_2} xf(x)dx = x[F(x_2) - F(x_1)] \text{ for } (x_1 \le x \le x_2)$$

where x_1 and x_2 are the lower and upper limits of bid x, respectively, and f(x) and F(x) are the probability density function and cumulative distribution function, respectively. By this method, the mean willingness to pay is the sum of all the submeans. Using the lower limit of each interval for every bid x_i and applying the above equation for each interval, the mean willingness to pay is obtained according to the following expression:

(18)

$$E(x) \approx x_1[F(x_2) - F(x_1)] + x_2[F(x_3) - F(x_2)] + x_3[F(x_4) - F(x_3)] + x_{n-1}[F(x_n) - F(x_{n-1})]$$

Note that in the case where a survey does not reveal the bid that drives acceptance to zero, the researcher needs to specify it. So, unlike Turnbull's non-parametric measure, Kriström's mean depends in part on this value and hence adds some arbitrariness to the estimation.

4 Data and Summary Statistics

The present paper uses data from two household surveys conducted in the six different rural regions in Bangladesh[17] and the south rural region of Peru[18]. For both countries, the survey followed a two stage random sampling procedure and focused on the respondent's willingness to pay for access to a public telephone service. Both surveys had four different bids for each type of call and used a dichotomous choice format. The survey divided all the respondents into four different groups, and each respondent was randomly assigned to encounter only one of the four bids[19]. In addition to the households' willingness to pay questions, the surveys also contained questions on the households' demographic and housing characteristics, employment, income and expenditure, participation in social programs, and availability of infrastructure, among other characteristics. Both surveys included settlements with and without a public telephone where a lack of a public telephone service was primarily due to a supply constraint instead of one of demand.[20]

Several researchers have recently examined the issue of survey related bias in the contingent valuation willingness to pay setting.[21] Two surveys on which the present study relies do not suffer from sample non-response bias. However, it is necessary to distinguish between unit non-response and item non-response. When a selected respondent does not respond to any of the survey questions, thereby exhibiting unit non-response, and when a respondent does not respond to some of the items of the survey, thereby exhibiting item non-response, estimated WTP suffers from non-response bias. In the present case, there is no unit non-response either in the case of Bangladesh or in the case of Peru, and the extent of item non-response is limited only to 3.2 percent in the case of Peru and a mere 1.4 percent in the case of Bangladesh.

Table-2 presents summary statistics of the tariff, household expenditure, time required to reach the nearest public telephone and distance to the nearest public telephone. Summary statistics for the full set of variables that are included in the estimation are provided in Appendix in table-A.1 and table-A.2. Among the covariates included in the parametric estimation, tariff and household expenditure are measured in local currency, time required to reach the nearest public telephone in hours and distance to the nearest telephone in kilometres.

[17] For a detail accounts of Bangladesh survey see Chowdhury (2002).
[18] For detail accounts of Peru survey see Torero, Galdo (2000).
[19] The four bids for each country where identified on a set of focus groups with technical experts to calculate the range of the bids (proposed amounts of willingness to pay) to be placed in the referendum.
[20] Many of the settlement inhabitants without access to a public telephone service travel many kilometres to arrive at a settlement that has the service.
[21] See Messonnier et al (2000) for a discussion on this issue. See also the references therein.

Table-2: Summary Statistics

Covariates	Bangladesh		Peru	
	Mean	Std Dev	Mean	Std Dev
Tariff (in US$)				
3 minutes local call	0.178	0.113	0.370	0.191
1 minute NLD call	0.405	0.265	0.555	0.253
1 minute international call	1.128	0.506		
Total yearly expenditure of HH (in US$)	1455.291	1753.401	2415.297	2093.312
Time required to arrive at the public telephone in hrs	0.612	0.585	0.305	0.8936
Distance to the nearest public telephone in km	4.887	5.391	9.412	38.397
Sample Size	284 households		1000 households	

Note: For Bangladesh figures are for 2001, and for Peru figures are for 1999. The exchange rate for Bangladesh was 1US$=Tk.56. For Peru, the exchange rate was 1US$=3.38S/. Exchange rate source for Peru: WDI 2001.

Other covariates that have been included in the case of Bangladesh are household characteristics such as gender, age, age squared, occupation and education of the head of the household, household's migration characteristics, and alternative communication means. In the case of Peru, additional covariates are advantages and disadvantages of public telephones, the cost of alternatives to public telephones, settlement dummies such as educational and health personnel, duration of calls and a public telephone dummy. Summary statistics of these covariates are provided in table-A.1 and table-A.2.

Turning to the response of surveyed households in the case of Bangladesh, the survey focused on the respondent's willingness to pay for three different types of telephone call: i) local call, ii) national long distance call, and iii) international call. Table-3 shows the responses according to the call type. The settlements are divided into with and without telephone access where a settlement with telephone access is defined as the distance of the nearest telephone within a range of 2 kilometers of the settlement.

In the case of Peru, the survey focused on the respondent's willingness to pay for two different types of telephone call: i) local call and ii) national long distance call. Table-3 and shows the responses according to the call type. The reason for exclusion of international calls in the case of Peru is already described. As usual, the households are divided based on settlements with and without telephone access where a settlement with telephone access is defined as a settlement having a public telephone and not otherwise.

Table-3: Bid Groups and WTP for a Local, NLD and International Call in Bangladesh and For Local and NLD Calls in Peru

Country	Bangladesh				Peru			
Call Type	Bid Groups (In local currency, Tk.)	TOTAL (%)	Settlement with Telephone access (%)	Settlement without Telephone access (%)	Bid Groups (In local currency, Soles)	TOTAL (%)	Settlement with Telephone access (%)	Settlement without Telephone access (%)
LOCAL CALL	*Bid 1:Tk. 1.7*	97.26	100.00	94.87	*Bid 1: S/. 0.50*	87.1	86.2	89.1
	Bid 2: Tk. 7	70.42	56.76	85.29	*Bid 2: S/. 1.0*	48.3	46.8	51.5
	Bid 3:Tk. 13	40.00	33.33	44.44	*Bid 3: S/. 1.50*	23.5	18.2	29.3
	Bid 4: Tk. 18	25.64	15.56	39.39	*Bid 4: S/. 2.0*	15.5	14.6	16.5
NLD CALL	*Bid 1: Tk. 3.4*	95.89	94.12	97.44	*Bid 1: S/. 1.0*	74.3	73.2	76.7
	Bid 2: Tk. 16	47.14	40.54	54.55	*Bid 2: S/. 1.5*	42.1	41.5	43.3
	Bid 3: Tk. 29	15.00	0.00	25.00	*Bid 3: S/. 2.0*	19.3	14.1	25.0
	Bid 4: Tk. 42	11.69	0.00	28.13	*Bid 4: S/. 3.0*	13.6	11.7	15.9
INT. CALL	*Bid 1: Tk. 26*	83.33	76.47	89.47				
	Bid 2:Tk. 51	58.57	54.05	63.64				
	Bid 3: Tk. 75	31.67	16.67	41.67				
	Bid 4: Tk. 100	32.05	24.44	42.42				

In Bangladesh, exchange rate, as of January-February 2001, was US$1=Tk.56.00; the price of a three minute local call varies from US$0.03 to US$0.32; the price of a one minute national long distance call varies from US$0.061 to US$0.75; the price of a one minute international call varies from US$0.46 to US$1.78. In Peru, exchange rate in 1999 was US$1=S/. 3.38; the price of a three-minute local call varies from US$0.148 to US$0.59; the price of a one-minute national long distance call varies from US$0.296 to US$0.888.

For local calls, at the lowest level of bid, around 82 percent of the respondents in Bangladesh, and around 89 percent of the households in Peru are willing to accept the bid. As the bid goes up, the percentage of households willing to accept goes down. For national long distance calls, around 66 percent of the households in Bangladesh and around 74 percent of the households in Peru are willing to accept the bid and, similar to local calls, as the bid increases, willingness to accept decreases. A similar trend is observed in the case of international calls in Bangladesh. For all three types of call and for both countries, high bid prices drive the WTP down; as the bid goes up, the percentage of household's willing to accept the bid goes down. However the present surveys neither reveal the lowest bid at which all households are willing to accept, nor the highest bid which drives the acceptance to zero. It is interesting to note that, for both local and long distance national calls both in Bangladesh and Peru, the percentage of households that accept bids at all levels of the bids is higher from the settlements without telephones than from the settlements with telephones.

In addition, the study calculates the surveyed households willingness dividing the respondents further on a poor/ not-poor basis. Here the poor/ not-poor classification is based on the respective country's national poverty line adjusted for the regional price differences. Controlling for settlements with and without a telephone, the poor/ not-poor classification does not show any additional price sensitivity of the poor compared to the not-poor. Similar to the total sample, the majority of poor households are willing to accept a low bid and, as the bid goes up, the acceptance goes down.

5 Estimations and Results

At this stage, the study proceeds in two steps: first, it estimates the parameters; second, it calculates mean willingness to pay using the estimated parameters. For the sake of tractability, they are discussed separately.

5.1 Parametric Estimation

The study has estimated parameters for local calls and long distance national calls for Peru and Bangladesh and for international calls for Bangladesh only. For both countries and for all types of call, it has utilized a logit model and a bounded probit model. To check the stability of the estimated parameters, it has used three different specifications for each of the models. So, essentially, the current study has estimated 6 regressions for each type of call per country and 30 regressions in total. The estimated parameters appear to be consistent, and signs of the coefficients are usually conformed to the prior expectations. The full set of estimated coefficients under different specifications is presented in Appendix (tables-A.3a to table-A.7).

Turning to the results, the coefficients of tariff and opportunity cost are significant both for local and long distance national calls for households in Peru and for all three types of call for households in Bangladesh. As expected, the higher the tariff, the less willing the household is to pay for it, implying that rural households are tariff-sensitive in their willingness to pay for access to a public telephone. For opportunity cost that accounts for travelling time and cost to reach the nearest publicly accessible telephone, which is the non-tariff access cost, and which could be substantial in a rural context. As the estimated coefficient of the opportunity cost is significant for all types of call, it appears that households' private time-price cost plays an important role in their willingness to pay for access to a public telephone. As the coefficients suggest, for Peru, the higher the time required to reach the nearest telephone, the higher the households' willingness to pay. This can also be observed in the case of households in Bangladesh. The coefficient of alternative means of communication to the telephone is also significant for local and national long distance calls both for Peru and Bangladesh; the higher the cost of the alternative, the higher the willingness to pay for a telephone. In addition, while households' members' migration to a city does not have any significant impact on WTP for local and LDN calls, households' members overseas migration is significant for international calls for Bangladesh.

There are two noticeable differences between the two countries. First, for local calls in Peru, income is a significant determinant of the households' willingness to pay while it is not statistically significant for the households' willingness to pay in Bangladesh. For Peru, it shows that the local telephone call is a normal consumption good as the household's willingness to pay

for a telephone increases with increased income. For Bangladesh, one possible explanation of this phenomenon is the lesser availability of alternative means of communication and the relative high cost of alternatives which make the local call price inelastic. Second, for Bangladesh, the coefficient of education is statistically significant for all three types of call while it is not significant for Peru (it has been dropped from Peru's regression as a result). However, note that in the case of Bangladesh, it is only the literate-illiterate category that is significant, and the marginal contribution of an additional year of schooling is not significant. This implies that a minimum level of schooling is required to demand a telephone, and that once the threshold is passed, there is no significant difference between differences in years of schooling.

5.2 Willingness to Pay Estimation

Table-4 to table-6 report parametric and non-parametric estimates of households' willingness to pay. For the Logit model, estimates are the untruncated mean, the mean truncated at zero but untruncated from above, and the truncated mean confined between zero and the maximum bid. For the bounded Probit model, the tables report the mean and median WTP. The tables also report two nonparametric alternative estimates of mean and median WTP. In addition, the range of estimated WTP under different specifications of parametric models is noted under the tables. The details of the nonparametric means are provided in table-A.8 to table-A.17 in the appendix.

In Peru, rural households' WTP for a three-minutes local call from a public telephone varies from US$0.25 to US$0.35 (0.85 soles to 1.18 soles), and for an LDN call varies from US$0.33 to US$0.45 (1.13 soles to 1.52 soles). The current rates are 0.17 and 0.29 for local and NLD call respectively. The gap is significant, i.e. rural households are willing to pay between 47% and 106% more for local calls and between 21% and 55% more for national long distance calls.

Similarly, in the case of rural households in Bangladesh, households' WTP for a three minute local call from a publicly accessible telephone varies from US$0.10 to US$0.26 (Tk. 5.73 to Tk.14.3), for a one minute LDN telephone call from US$0.23 to US$0.50 (Tk.12.67 to Tk.27.84), and for an international call from US$0.93 to US$1.35 (Tk.51.92 to Tk.75.33). There is therefore a significant difference with current charges. Currently the rates are US$0.03 for local call, US$0.06 to US$0.75 for LDN[22] call and US$0.46 to US$1.78 for international call depending on the distance and peak and off-peak period. For the cellular telephony, which will

[22] For local long distance call, with the exception of GrameenPhone that has established its own network, other mobile operators put a charge on the state monopoly Bangladesh Telegraph and Telephone Board (BTTB)'s tariff as all they depend on BTTB's networks. For international call, the tariff is very much in line with BTTB for all mobile operators as BTTB has a monopoly right over all international calls and other operators depend on it. The rural households that use Grameen Bank's (and Grameen Phone) village pay phone (VPP), the pay the same rate as of urban users of cellular phone. There is no price discrimination between rural and urban users.

be the one used by the Gremeen Village Pay Phone (VPP), all four providers charge US$0.07 per call for the first minute for a cellular to cellular call, and they charge US$0.1 for a cellular to fixed telephony call.

Although, the estimated total benefits of access to a telephone for rural households vary depending on which method one employs in the estimation process, in all the cases and for both countries the estimates are over to what they currently charge for the service. This is consistent with the multiple benefits that rural households obtain with the access to a public telephone service both in Bangladesh and in Peru. But which estimated WTP figure represents the actual project benefits of a rural telephony project in Bangladesh or in Peru? Habb and McConnell (1997) argue for the median WTP, as it is less sensitive to distributional misspecifications and estimation methods. However, all the benefit measures can be considered as equally valid given that they at least will give a range over which scenarios of potential benefits can be built.

The variation of benefits and their magnitudes show that it is not possible to find a single number that correctly represents households' willingness to pay for access to a public telephone. However, the net benefits of access to a telephone remain positive irrespective of the estimation method. The estimates of both parametric and non-parametric measures of WTP for all types of call for both Bangladesh and Peru suggest that rural households are willing to pay at least as much as the prevailing tariff rate to get access to the public telephone. In fact, households' WTP for local and LDN calls in Peru, and local, LDN and international calls in Bangladesh is higher than the prevailing tariff rate. Though the different estimates of WTP that have been employed here vary from each other, each of the WTP estimates is higher than the existing tariff rate, making households' lowest WTP higher than the level of existing tariff.

This result is of great importance especially in the case of Bangladesh VPP program, where there is no explicit subsidy and only the positive externality coming from the existing infrastructure and social networks of Grameen Bank[23]. What this means is that despite charging over marginal costs there is still a significant demand on rural households making it attractive for private investment. For the case of Peru where there is the same rate in rural and urban areas, it is also opening a window for possible consumption plans in rural areas that could reduce the existing cross-subsidy from urban to rural areas making it also more attractive for private investment. Even more, and within the objectives of the Investment Fund in Telecommunications (FITEL) the WTP results are a indicator that the fund can require a higher coverage for the companies winning the bids for the funds.

[23] Grameen Telecom (owned by Grameen Bank) buys bulk airtime from the Grameen Phone at a discounted rate and passes it to the VPP owners (see Chowdhury 2002 for details). VPP owners pay 13 percent on the airtime charge to cover Grameen Telecom's overhead costs and Grameen Bank's collection costs. Grameen Phone does not incur any additional investment for the VPP program. Despite the lower rate that it offers, the VPP program is a profitable venture for Grameen Phone. Two specific reasons that explain this apparent contradiction are first, high airtime usage of VPP and second, minimum operating cost. As written in Grameen Phone's annual report, ''even with discounted prices given by GrameenPhone, it has proven to be a profitable business for GrameenPhone'' (Grameen Phone, 2000, pp. 25-26).

Table-4: Households' WTP for Local Calls (in US$)

		Peru	Bangladesh
Parametric Estimation-Logit			
Mean WTP [1/]	-infinity<WTP<+infinity	0.337	0.219
		(0.009)	(0.011)
Truncated Mean WTP [2/]	0<WTP<+infinity	0.341	0.223
		(0.009)	(0.011)
Truncated Mean WTP [3/]	0<WTP< Bmax	0.252	0.178
		(0.004)	(0.006)
Parametric Estimation-Probit			
Median WTP [4/]		0.300	0.189
		(0.008)	(0.014)
Mean WTP [5/]		0.350	0.255
		(0.022)	(0.025)
Non-parametric-Turnbull			
Mean WTP		0.264	0.162
		(0.002)	(0.036)
Median WTP			0.102
Non-parametric-Kriström			
Mean WTP		0.324	0.209
		(0.015)	(0.035)
Median			0.160

Numbers in the parentheses are the standard errors. Standard errors are computed through bootstrap procedure based on 100 replications for each sample. [1/] For Peru the mean WTP estimated from model 1 to model 3 varies from US$0.335 to US$0.337, and for Bangladesh it varies from US$0.218 to US$0.219. [2/] For Peru the mean WTP estimated from model to model 3 varies from US$0.339 to US$0.341, and for Bangladesh, it varies from US$0.222 to US$0.223. [3/] For Peru the mean WTP estimated from model to model 3 varies from US$0.249 to US$0.252 and for Bangladesh, it varies from US$0.177 to US$0.178. [4/] For Peru the median estimated from model to model 3 varies from US$0.299 to US$0.3 and for Bangladesh, it varies from US$0.187 to US$0.189. [5/] For Peru the mean WTP estimated from model to model 3 varies from US$0.350 to US$0.353 and for Bangladesh, it varies from US$0.255 to US$0.258.

Table-5: Households' WTP for LDN Calls (in US$)

		Peru	Bangladesh
Parametric Estimation-Logit			
Mean WTP [1/]	-infinity<WTP<+infinity	0.428	0.331
		(0.011)	(0.025)
Truncated Mean WTP [2/]	0<WTP<+infinity	0.432	0.341
		(0.010)	(0.023)
Truncated Mean WTP [3/]	0<WTP< Bmax	0.340	0.327
		(0.007)	(0.021)
Parametric Estimation-Probit			
Median WTP [4/]		0.409	0.255
		(0.009)	(0.018)
Mean WTP [5/]		0.451	0.320
		(0.016)	(0.022)
Non-parametric-Turnbull			
Mean WTP		0.333	0.226
		(0.010)	(0.069)
Median WTP			0.265
Non-parametric-Kriström			
Mean WTP		0.416	0.337
		(0.013)	(0.054)
Median			0.497

Numbers in the parentheses are the standard errors. Standard errors are computed through bootstrap procedure based on 100 replications for each sample. [1/] For Peru the mean WTP estimated from model 1 to model 3 does not vary, and for Bangladesh it varies from US$0.331 to US$0.334. [2/] For Peru the mean WTP estimated from model to model 3 varies from US$0.432 to US$0.433, and for Bangladesh, it varies from US$0.341 to US$0.343. [3/] For Peru the mean WTP estimated from model to model 3 varies from US$0.337 to US$0.34 and for Bangladesh, it varies from US$0.327 to US$0.329. [4/] For Peru the median estimated from model to model 3 varies from US$0.408 to US$0.409 and for Bangladesh, it varies from US$0.255 to US$0.259. [5/] For Peru the mean WTP estimated from model to model 3 varies from US$0.451 to US$0.452 and for Bangladesh, it varies from US$0.32 to US$0.324.

Table-6: Households' WTP for International Calls (in US$)

		Bangladesh
Parametric Estimation-Logit		
Mean WTP [1/]	-infinity<WTP<+infinity	1.210
		(0.108)
Truncated Mean WTP [2/]	0<WTP<+infinity	1.248
		(0.104)
Truncated Mean WTP [3/]	0<WTP< Bmax	0.957
		(0.034)
Parametric Estimation-Probit		
Median WTP [4/]		1.099
		(0.106)
Mean WTP [5/]		1.345
		(0.148)
Non-parametric-Turnbull		
Mean WTP		0.927
		(0.239)
Median WTP		1.065
Non-parametric-Kriström		
Mean WTP		1.149
		(0.261)
Median		1.203

Numbers in the parentheses are the standard errors. Standard errors are computed through bootstrap procedure based on 100 replications for each sample. [1/] The mean WTP estimated from model 1 to model 3 varies from US$1.188 to US$1.21. [2/] The mean WTP estimated from model to model 3 varies from US$1.241 to US$1.251. [3/] The mean WTP estimated from model to model 3 varies from US$.934 to US$0.957. [4/] The median estimated from model to model 3 varies from US$1.088 to US$1.107. [5/] The mean WTP estimated from model to model 3 varies from US$1.345 to US$1.377.

6 Conclusions

This paper has measured the welfare impact of the availability of a telephone on rural households through the measurement of households' WTP. To elicit a household's WTP, the paper has relied on a contingent valuation method and used a simple referendum method in a dichotomous setting to reveal the household's willingness to pay. In contingent valuation, the use of the referendum method has become the presumptive approach. One major reason for this wide acceptance is that the referendum model appears to be incentive compatible and thus does not suffer from strategic behaviour in revealing the truth, which is a major concern with contingent valuation.

The estimation of willingness to pay can be done through parametric or non-parametric approximations. The parametric estimation specifies a parametric model in which the relation between the willingness to pay and a household's intrinsic characteristics is stated. In contrast, non-parametric approximation estimates the distribution of the willingness to pay without assuming any parametric specification of the preferences distribution.

The paper has utilized both parametric and non-parametric methods in estimating rural households' willingness to pay for access to a public telephone. For parametric estimation, the paper has relied on a logit model and a bounded probit model. For non-parametric estimation, the paper has relied on Turnbull's algorithm and Kriström's non-parametric measure. Despite differences in willingness to pay figures that are derived from the parametric and non-parametric methods, both parametric and non-parametric estimations suggest that rural telecommunications projects are welfare enhancing.

This result is of extreme importance for the design of projects to extend rural telecommunications to achieve universal access. Normally, most of the projects of rural telecommunications start their economic evaluation assuming households are not willing to pay at least the marginal costs of the service. The results of the WTP exercise clearly show, no matter the method, that telephones are welfare enhancing and therefore household's will be willing to pay for their use reducing the need for excessive subsidies.

Appendix

Table-A.1: Summary Statistics of Covariates: Peru

Covariates	Minimum	Maximum	Mean	Std. Deviation
Logarithm of the tariff	0.5	2	1.236	0.5632
Logarithm of the expenditure	4.60	9.01	6.292	0.6575
Populated rural center with public phone	0	1	0.500	0.5003
Time required to arrive at the public telephone (hours)	0	4.5	0.305	0.8936
Benefits of using telephone				
Fast communication (yes=1, no=0)	0	1	0.611	0.4877
It avoids trips (yes=1, no=0)	0	1	0.217	0.4123
It avoids isolation (yes=1, no=0)	0	1	0.126	0.3315
It saves money (yes=1, no=0)	0	1	0.087	0.2825
It saves time (yes=1, no=0)	0	1	0.127	0.3326
Useful in emergency (yes=1, no=0)	0	1	0.257	0.4372
Disadvantages in the use of public telephone				
Excessive distance to the public telephone (yes=1, no=0)	0	1	0.246	0.4309
Costly (yes=1, no=0)	0	1	0.170	0.3755
Bad communication (yes=1, no=0)	0	1	0.068	0.2523
I don't find the person (yes=1, no=0)	0	1	0.063	0.2435
Timetable restriction (yes=1, no=0)	0	1	0.179	0.3833
No disadvantage (yes=1, no=0)	0	1	0.011	0.1046
Logarithm of transfers to relative (proxy of migration)	0	9.29	0.799	2.0066
Cost of alternative communication means:				
Need to travel	0	80	0.764	3.8987
Letter shipment through relatives	0	500	2.297	17.3512
Shipment charges	0	150	1.234	7.5309
Communication by radio	0	200	0.607	6.5395
Need to travel to the next populated center with public telephone	0	300	2.243	10.9659
Shipment of mail	0	15	0.172	1.1983
Duration of the calls	0	4	1.630	1.1146
Educational personal in the CCPP	0	1	0.065	0.2466
Health personnel	0	1	0.010	0.0995

Table-A.2: Summary Statistics of Covariates: Bangladesh

Covariates	Minimum	Maximum	Mean	Std. Deviation
Tariff				
3 minutes local call	1.7	18.0	9.947	6.313
1 minute NLD call	3.4	42.0	22.696	14.832
1 minute international call	26.0	100.0	63.188	28.333
Total yearly expenditure of HH (in LCU)	6300	1055000,00	81496,29	98190,44
Opportunity cost of Telephone (in LCU)	0	52,5	15,50	13,76
Distance of post office (in km)	0	7	2,37	2,00
Migration city	0	8	0.22	0.75
Migration abroad	0	9	0.44	1.33
sex of the head of the HH	0	1	0.94	0.23
Age of the head of the household (HH)	15	85	46,57	12,74
Age square of the head of the HH	225	7225	2330,14	1281,79
ocu, head, dummy, non ag 1, ag	0	1	0.46	0.50
Illiterate, literature, edu, he	0	1	0.84	0.37

Table-A.3: WTP for the Local Rural Public Telephone Service in Bangladesh, Logit and Bounded Probability Models

Dependent Variable: Accept to pay bj Taka (Standard Errors are in the parenthesis)

Explanatory Variables	Logit Models			Bounded Probit Models		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Tariff	-0.23340	-0.23920	-0.24200	-1.12780	-1.14870	-1.16850
	(0.0278)**	(0.0286)**	(0.0291)**	(0.1388)**	(0.1418)**	(0.1455)**
Logarithm of HH expenditure	0.14080	0.11310	-0.03430	0.09090	0.07550	-0.00590
	(0.1917)	(0.1944)	(0.20560)	(0.1138)	(0.1161)	(0.1223)
Opportunity cost of tel use (travel time and travel exp for tel)	0.33210	0.41360	0.42320	0.20820	0.25240	0.27740
	(0.1313)*	(0.1446)**	(0.1493)**	(0.0779)**	(0.0848)**	(0.0888)**
Distance of post office (alternative communication means)		-0.10510	-0.14370		-0.05810	-0.08860
		(0.0828)	(0.08720)		(0.0483)	(0.0516)
Family members migrated to city (yes=1)		0.17350	0.23410		0.10420	0.13130
		(0.2449)	(0.26570)		(0.1375)	(0.1466)
Family members migrated abroad (yes=1)		0.15320	0.15340		0.07630	0.07630
		(0.1247)	(0.13100)		(0.072)	(0.0741)
Household characteristics						
Gender of the head of the household (male=1)			0.14880			0.0978
			(0.66470)			(0.3887)
Age of the head of the household			0.06270			0.05480
			(0.07990)			(0.0478)
Age square of the head of the household			-0.00070			-0.00050
			(0.00080)			(0.0005)
Occupation of the head of the household			0.25210			0.08500
			(0.32720)			(0.1929)
Education of the head of the household			1.07040			0.65040
			(0.4556)*			(0.2644)*
Constant	0.55660	0.89340	0.05000	-5.6283	-5.595	-6.91410
	(2.1416)	(2.1498)	(2.95050)	(1.1713)**	(1.1853)**	(1.7515)**
Log likelihood	-137.128	-134.991	-130.62	-133.492	-131.661	-127.172
Number of observations	282	282	282	282	282	282
Sigma				-0.887	-0.871	-0.856
Wald chi2	108.47	112.74	121.48	115.74	119.40	128.38
Probability>chi2	0.000	0.000	0.000	0.000	0.000	0.000

***, **, *: Significant at 1%, 5% and 10% respectively

Table-A.4: WTP for the Local Rural Public Telephone Service in Peru, Logit and Bounded Probability Models

(Dependent Variable: Accept to pay bj soles (Standard Errors are in the parenthesis)

Explanatory Variables	Logit Models						Bounded Probit Models					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Tariff	-2.77739	***	-2.84575	***	-2.87252	***	-1.76398	***	-1.79308	***	-1.80866	***
	(0.1973)		(0.2040)		(0.2015)		(0.1067)		(0.1091)		(0.1088)	
Logarithm of the expenditure	0.29779	**	0.30216	**	0.28087	**	0.18413	**	0.18725	**	0.17203	**
	(0.1303)		(0.1361)		(0.1411)		(0.0759)		(0.0789)		(0.0814)	
Populated rural center with public phone	-0.39935	**	-0.43023	**	-0.39988	**	-0.23350	**	-0.24972	**	-0.23986	**
	(0.1991)		(0.2029)		(0.2102)		(0.1170)		(0.1187)		(0.1224)	
Time required to arrive at the public telephone (hours)	0.45651	**	0.46932	***	0.46758	***	0.26680	***	0.27370	***	0.26912	***
	(0.1006)		(0.1024)		(0.1027)		(0.0568)		(0.0575)		(0.0578)	
Benefits of using telephone												
Fast communication (yes=1, no=0)	0.55333	***	0.59184	***	0.59676	***	0.33818	***	0.36251	***	0.36376	***
	(0.2010)		(0.2003)		(0.2035)		(0.1186)		(0.1186)		(0.1202)	
It avoids trips (yes=1, no=0)	0.88759	***	0.94684	***	0.96830	***	0.51718	***	0.54737	***	0.55452	***
	(0.2350)		(0.2341)		(0.2363)		(0.1364)		(0.1365)		(0.1371)	
It avoids isolation (yes=1, no=0)	0.15696		0.19130		0.15721		0.09348		0.11330		0.10651	
	(0.2635)		(0.2694)		(0.2790)		(0.1526)		(0.1575)		(0.1613)	
It saves money (yes=1, no=0)	0.15737		0.11321		0.20279		0.12936		0.10480		0.15309	
	(0.3133)		(0.3185)		(0.3232)		(0.1799)		(0.1818)		(0.1832)	
It saves time (yes=1, no=0)	-0.15466		-0.19121		-0.19039		-0.06262		-0.08399		-0.08123	
	(0.2457)		(0.2432)		(0.2458)		(0.1452)		(0.1444)		(0.1460)	
Useful in emergency (yes=1, no=0)	0.45609	**	0.46382	**	0.47100	**	0.26593	**	0.26543	**	0.27636	**
	(0.2245)		(0.2278)		(0.2304)		(0.1278)		(0.1286)		(0.1293)	
Disadvantages in the use of public telephone												
Excessive distance to the public telephone (yes=1, no=0)	-0.62998	***	-0.62773	***	-0.52471	**	-0.36690	***	-0.36201	***	-0.30923	**
	(0.2320)		(0.2341)		(0.2502)		(0.1363)		(0.1372)		(0.1461)	
Costly (yes=1, no=0)	-0.00374		0.01668		0.00483		0.00197		0.01189		0.00277	
	(0.2259)		(0.2296)		(0.2389)		(0.1330)		(0.1344)		(0.1377)	
Bad communication (yes=1, no=0)	-0.31496		-0.35624		-0.35053		-0.15635		-0.18052		-0.19373	
	(0.3424)		(0.3401)		(0.3430)		(0.2003)		(0.1974)		(0.1966)	
I don’t find the person (yes=1, no=0)	0.83522	**	0.80963	**	0.73633	**	0.41925	**	0.39818	**	0.36852	*
	(0.3480)		(0.3444)		(0.3561)		(0.2021)		(0.2033)		(0.2050)	
Timetable restriction (yes=1, no=0)	-0.31154		-0.25722		-0.29753		-0.14463		-0.11362		-0.14855	
	(0.2226)		(0.2247)		(0.2254)		(0.1306)		(0.1311)		(0.1314)	

Table-A.4: (Continues)

Explanatory Variables	Logit Models			Bounded Probit Models		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
No disadvantage (yes=1, no=0)	0.99830 *	0.94524	1.03079 *	0.63152 *	0.59912	0.65028 *
	(0.5889)	(0.6046)	(0.6055)	(0.3775)	(0.3880)	(0.3887)
Logarithm of transfers to relative (proxy of migration)		0.04069	0.03610		0.02367	0.02045
		(0.0423)	(0.0442)		(0.0247)	(0.0256)
Cost of alternative communication means:						
Need to travel		0.03915 **	0.03602 *		0.01982	0.01817
		(0.0198)	(0.0203)		(0.0133)	(0.0133)
Letter shipment through relatives		-0.00112	-0.00089		-0.00038	-0.00030
		(0.0036)	(0.0035)		(0.0024)	(0.0024)
Shipment charges		0.00055	0.00208		0.00039	0.00119
		(0.0134)	(0.0131)		(0.0075)	(0.0074)
Communication by radio		-0.06093	-0.05199		-0.03525	-0.02995
		(0.0407)	(0.0402)		(0.0245)	(0.0249)
Need to travel to the next populated center with public telephone		0.00715	0.00775 *		0.00388	0.00398
		(0.0046)	(0.0046)		(0.0032)	(0.0031)
Shipment of mail		0.09393	0.07445		0.05968	0.04941
		(0.0720)	(0.0805)		(0.0382)	(0.0411)
Duration of the calls			-0.08575			-0.03977
			(0.0796)			(0.0468)
Educational personnel in the CCPP			1.17880 ***			0.67465 ***
			(0.4100)			(0.2112)
Health personnel			-0.98858			-0.55601
			(0.6379)			(0.3955)
Constant	0.84683	0.79902	1.00737	-9.48837 ***	-9.69683 ***	-9.65643 ***
	(0.8109)	(0.8508)	(0.8785)	(0.6926)	(0.7118)	(0.7215)
Log likelihood	-469.96	-463.92	-456.09	-459.06	-453.64	-446.17
Number of observations	971	971	971	971	971	971
				-0.567	-0.558	-0.553
Wald chi2	215.2	214.4	233.52	295.0	294.1	314.28
Probability > chi2	0.000	0.000	0.000	0.000	0.000	0.000

***, **, *: Significant at 1%, 5% and 10% respectively.

Table-A.5: WTP for the NLD Rural Public Telephone Service in Bangladesh, Logit and Bounded Probability Models

Dependent Variable: Accept to pay bj Taka (Standard Errors are in the parenthesis)

Explanatory Variables	Logit Models			Bounded Probit Models		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Tariff	-0.13180	-0.13520	-0.13680	-1.25800	-1.29560	-1.33900
	(0.0150)**	(0.0155)**	(0.0159)**	(0.1321)**	(0.1363)**	(0.1441)**
Logarithm of HH expenditure	0.49170	0.47780	0.39330	0.29690	0.28240	0.23010
	(0.2130)*	(0.2210)*	(0.23040)	(0.1262)*	(0.1298)*	(0.1356)~
Opportunity cost of tel use (travel time and travel exp for tel)	0.36820	0.25480	0.26720	0.26340	0.18440	0.21440
	(0.1449)*	(0.15700)	(0.16340)	(0.0890)**	(0.0963)~	(0.1003)*
Distance of post office (alternative communication means)		0.26080	0.22210		0.16430	0.13610
		(0.0918)**	(0.0955)*		(0.0528)**	(0.0553)*
Family members migrated to city (yes=1)		0.10880	0.12100		0.07030	0.07850
		(0.19640)	(0.18730)		(0.1205)	(0.1146)
Family members migrated abroad (yes=1)		0.11180	0.10680		0.06050	0.06330
		(0.15730)	(0.16420)		(0.0896)	(0.094)
Household characteristics						
Gender of the head of the household (male=1)			0.62950			0.4098
			(0.74960)			(0.4857)
Age of the head of the household			0.03790			0.06390
			(0.08950)			(0.0556)
Age square of the head of the household			-0.00040			-0.00060
			(0.0009)			(0.0006)
Occupation of the head of the household			-0.17730			-0.18630
			-0.36480			(0.2191)
Education of the head of the household			1.03310			0.69130
			(0.5236)*			(0.3430)*
Constant	-3.75690	-3.97270	-5.23830	-7.5813	-7.8527	-9.94550
	(2.33000)	(2.40440)	(3.20550)	(1.2632)**	(1.3064)**	(1.9754)**
Log likelihood	-116.444	-112.048	-109.458	-107.367	-102.316	-98.942
Number of observations	280	280	280	280	280	280
Sigma				-0.795	-0.772	-0.747
Wald chi2	150.10	158.89	164.07	168.26	178.36	185.11
Probability>chi2	0.000	0.000	0.000	0.000	0.000	0.000

***, **, *: Significant at 1%, 5% and 10% respectively.

Table-A.6: WTP for the NLD Rural Public Telephone Service in Peru, Logit and Bounded Probability Models

Dependent Variable: Accept to pay bj soles (Standard Errors are in the parenthesis)

Explanatory Variables	Logit Models			Bounded Probit Models		
Logarithm of the tariff	-2.29331 ***	-2.35617 ***	-2.35914 ***	-2.13046 ***	-2.17636 ***	-2.17996 ***
	(0.1773)	(0.1812)	(0.1819)	(0.1451)	(0.1476)	(0.1480)
Logarithm of the expenditure	0.27618 **	0.27868 **	0.25008 **	0.16948 **	0.17024 **	0.15139 **
	(0.1271)	(0.1304)	(0.1343)	(0.0746)	(0.0771)	(0.0792)
Populated rural center with public phone	-0.54657 ***	-0.60712 ***	-0.62334 ***	-0.32481 ***	-0.36003 ***	-0.37539 ***
	(0.1936)	(0.1973)	(0.2005)	(0.1132)	(0.1148)	(0.1168)
Time required to arrive at the public telephone (hours)	0.20559 **	0.20949 **	0.20301 **	0.12379 **	0.12552 **	0.12055 **
	(0.1020)	(0.1027)	(0.1026)	(0.0570)	(0.0574)	(0.0576)
Benefits of using telephone						
Fast communication (yes=1, no=0)	0.04050	0.06846	0.06729	0.02174	0.04004	0.03821
	(0.1896)	(0.1898)	(0.1907)	(0.1117)	(0.1116)	(0.1120)
It avoids trips (yes=1, no=0)	0.64158 ***	0.66937 ***	0.67554 ***	0.37917 ***	0.39248 ***	0.39674 ***
	(0.2174)	(0.2150)	(0.2156)	(0.1271)	(0.1262)	(0.1264)
It avoids isolation (yes=1, no=0)	0.52548 **	0.50563 **	0.50744 **	0.30369 **	0.29012 **	0.29267 **
	(0.2395)	(0.2466)	(0.2461)	(0.1411)	(0.1462)	(0.1458)
It saves money (yes=1, no=0)	0.19004	0.12491	0.15526	0.11960	0.08024	0.09725
	(0.2989)	(0.2989)	(0.2998)	(0.1741)	(0.1746)	(0.1745)
It saves time (yes=1, no=0)	-0.25531	-0.29455	-0.27863	-0.16016	-0.18856	-0.18026
	(0.2341)	(0.2321)	(0.2302)	(0.1389)	(0.1377)	(0.1368)
Useful in emergency (yes=1, no=0)	0.05509	0.07725	0.09451	0.03791	0.04410	0.05710
	(0.1975)	(0.1976)	(0.1973)	(0.1168)	(0.1157)	(0.1155)
Disadvantages in the use of public telephone						
Excessive distance to the public telephone (yes=1, no=0)	-0.59307 ***	-0.57369 ***	-0.59135 **	-0.35072 **	-0.33734 **	-0.35077 **
	(0.2381)	(0.2422)	(0.2563)	(0.1384)	(0.1400)	(0.1476)
Costly (yes=1, no=0)	0.29419	0.34690	0.32261	0.18404	0.21314	0.19810
	(0.2279)	(0.2321)	(0.2378)	(0.1316)	(0.1331)	(0.1357)
Bad communication (yes=1, no=0)	0.19252	0.19117	0.16813	0.12734	0.12258	0.10604
	(0.3240)	(0.3286)	(0.3295)	(0.1914)	(0.1922)	(0.1926)
I don't find the person (yes=1, no=0)	0.78628 **	0.78335 ***	0.75383 **	0.44999 **	0.44057 **	0.42831 **
	(0.3044)	(0.3012)	(0.3028)	(0.1784)	(0.1775)	(0.1779)
Timetable restriction (yes=1, no=0)	0.13137	0.21191	0.17618	0.09331	0.13978	0.11533
	(0.2168)	(0.2216)	(0.2259)	(0.1283)	(0.1303)	(0.1324)

Table-A6 (continues)

Explanatory Variables	Logit Models			Bounded Probit Models		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
No disadvantage (yes=1, no=0)	0.88434	0.85975	0.87610	0.47024	0.45359	0.46863
	(0.8419)	(0.8339)	(0.8366)	(0.4814)	(0.4811)	(0.4826)
Logarithm of transfers to relative (proxy of migration)		0.04497	0.04173		0.02856	0.02542
		(0.0403)	(0.0403)		(0.0238)	(0.0238)
Cost of alternative communication means:						
Need to travel		0.05352 **	0.05259 **		0.03023 **	0.02979 **
		(0.0218)	(0.0213)		(0.0136)	(0.0134)
Letter shipment through relatives		-0.00868	-0.00858		-0.00454	-0.00454
		(0.0077)	(0.0077)		(0.0040)	(0.0040)
Shipment charges		-0.01115	-0.01071		-0.00747	-0.00714
		(0.0107)	(0.0107)		(0.0059)	(0.0059)
Communication by radio		-0.03292	-0.03079		-0.01839	-0.01718
		(0.0249)	(0.0217)		(0.0150)	(0.0122)
Need to travel to the next populated center with public telephone		0.00692	0.00667		0.00395	0.00373
		(0.0052)	(0.0051)		(0.0036)	(0.0035)
Shipment of mail		0.10283	0.09268		0.06454 *	0.05925
		(0.0690)	(0.0733)		(0.0377)	(0.0392)
Duration of the calls			0.03197			0.02397
			(0.0779)			(0.0459)
Educational personnel in the CCPP			0.33650			0.20417
			(0.3729)			(0.2084)
Health personnel			-0.27426			-0.11147
			(0.6157)			(0.3883)
Constant	1.55849 *	1.56303 *	1.69737 **	-10.17093 ***	-10.41314 ***	-10.3438 ***
	(0.8010)	(0.8159)	(0.8313)	(0.7668)	(0.7880)	(0.7945)
Log likelihood	-500.21	-491.92	-491.11	-497.21	-489.15	-488.25
Number of observations	968	968	968	968	968	968
				-0.469	-0.459	-0.459
Wald chi2	186.4	194.7	199.1	240.9	251.6	256.8
Probability > chi2	0.000	0.000	0.000	0.000	0.000	0.000

***, **, *: Significant at 1%, 5% and 10% respectively.

Table-A.7: WTP for the International Long Distance Rural Public Telephone Services in Bangladesh: Logit and Bounded Probability Models

Dependent Variable: Accept to pay bj taka (Standard errors are in the parenthesis)

Explanatory Variables	Logit Models			Bounded Probit Models		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Tariff	-0.03350	-0.03710	-0.037	-1.04820	-1.14390	-1.1472
	(0.0052)**	(0.0056)**	(0.0057)**	(0.1519)**	(0.1604)**	(0.1631)**
Logarithm of HH expenditure	0.76860	0.65310	0.5703	0.44570	0.37010	0.3199
	(0.1919)**	(0.1993)**	(0.2054)**	(0.1090)**	(0.1121)**	(0.1160)**
Opportunity cost of tel use (travel time and travel exp for tel)	0.27190	0.37430	0.3831	0.16900	0.22550	0.2346
	(0.1181)*	(0.1376)**	(0.1422)**	(0.0696)*	(0.0803)**	(0.0832)**
Distance of post office (alternative communication means)		0.11720	0.1089		0.06730	0.0632
		(0.07710)	(0.08050)		(0.0454)	(0.0477)
Family members migrated to city (yes=1)		-0.01870	-0.0068		-0.00870	-0.0004
		(0.17920)	(0.17990)		(0.1122)	(0.1111)
Family members migrated abroad (yes=1)		0.75040	0.75		0.41200	0.4083
		(0.2124)**	(0.2112)**		(0.1081)**	(0.1073)**
Household characteristics						
Gender of the head of the household (male=1)			0.1099			0.0313
			(0.64560)			(0.3785)
Age of the head of the household			0.1113			0.0735
			(0.07720)			(0.0467)
Age square of the head of the household			-0.001			-0.0007
			(0.00080)			(0.0005)
Occupation of the head of the household			0.3171			0.1632
			(0.31020)			(0.1843)
Education of the head of the household			0.4914			0.3121
			(0.44050)			(0.2656)
Constant	-6.79270	-6.07380	-8.6947	-6.278	-6.2782	-8.1242
	(2.1066)**	(2.1750)**	(2.9379)**	(1.0309)**	(1.0605)**	(1.6212)**
Log likelihood	-158.269	-146.079	-143.381	-156.444	-144.664	-141.819
Number of observations	280	280	280	280	280	280
Sigma				-0.954	-0.874	-0.872
Wald chi2	71.27	95.65	101.04	74.92	98.48	104.17
Probability>chi2	0.000	0.000	0.000	0.000	0.000	0.000

***, **, *: Significant at 1%, 5% and 10% respectively.

NONPARAMETRIC ESTIMATION:

Table-A.8: WTP for Local Call in Peru: Turnbull lower bound Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	0.1042	0.1042	0.0000				
0.50	0.5061	0.4019	0.2009				
1.00	0.7605	0.2544	0.2544				
1.50	0.8465	0.0860	0.1290				
2.00	1.0000	0.1535	0.3071	0.8913	0.0075	0.8766	0.9060

Table-A.9: WTP for Local Call in Peru: Kriström Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	1.0000	0.0000	0.0000				
0.25	0.8958	0.1042	0.0261				
0.75	0.4939	0.4019	0.3014				
1.25	0.2395	0.2544	0.3180				
1.75	0.1535	0.0860	0.1504				
2.00	0.0000	0.1504	0.3009	1.0968	0.0505	0.9979	1.1957

Table-A.10: WTP for LDN Call in Peru: Turnbull Lower bound Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.0	0.254	0.254	0.000				
1.0	0.577	0.323	0.323				
1.5	0.798	0.221	0.332				
2.0	0.866	0.068	0.136				
2.5	1.000	0.134	0.334	1.125	0.033	1.0596	1.1909

Table-A.11: WTP for LDN Call in Peru: Kriström Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	1.000	0.000	0.000				
0.50	0.746	0.254	0.127				
1.25	0.423	0.323	0.404				
1.75	0.202	0.221	0.387				
2.25	0.134	0.068	0.153				
2.50	0.000	0.134	0.334	1.405	0.046	1.3160	1.4947

Table-A.12: WTP for Local Call in Bangladesh: Kriström Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	1.000	0.000	0.000				
1.70	0.973	0.027	0.023				
7.00	0.704	0.268	1.167				
13.00	0.400	0.304	3.042				
18.00	0.256	0.144	2.226				
23.000	0.000	0.256	5.256	11.715	1.985	7.825324	15.60474

Table-A.13: WTP for LDN Call in Bangladesh: Kriström Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	1.000	0.000	0.000				
3.40	0.959	0.041	0.070				
16.00	0.471	0.487	4.729				
29.00	0.150	0.321	7.232				
42.00	0.117	0.033	1.176				
42.000	0.000	0.117	5.669	18.875	3.039	12.919	24.831

Table-A.14: WTP for International Call in Bangladesh: Kriström Nonparametric Mean

Bj	Cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
0.00	1.000	0.000	0.000				
26.00	0.833	0.167	2.167				
51.00	0.586	0.248	9.533				
75.00	0.317	0.269	16.950				
100.00	0.321	-0.004	-0.337				
100.00	0.000	0.321	36.058	64.371	14.615	35.725	93.017

Table-A.15: WTP for Local Call in Bangladesh: Turnbull Lower Bound Nonparametric Mean

Bj	Cdfj	pdfj	Lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
1.7	0.027	0.027	0.000				
7	0.296	0.268	0.456				
13	0.600	0.304	2.130				
18	0.744	0.144	1.867				
>18	1.000	0.256	4.615	9.068	2.038382	5.072642	13.063

Table-A.16: WTP for NLD Call in Bangladesh: Turnbull Lower Bound Nonparametric Mean

Bj	cdfj	pdfj	Lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
3.4	0.041	0.041	0.000				
16	0.529	0.487	1.657				
29	0.850	0.321	5.143				
42	0.883	0.033	0.960				
>42	1.000	0.117	4.909	12.670	2.351223	8.061358	17.278

Table-A.17: WTP for International Call in Bangladesh: Turnbull Lower Bound Nonparametric Mean

Bj	cdfj	pdfj	lj	E(WTP)	Std Dev.	Confidence Interval (95%)	
26	0.167	0.167	0.000				
51	0.414	0.248	6.438				
75	0.683	0.269	13.721				
100	0.679	-0.004	-0.288				
>100	1.000	0.321	32.051	51.922	13.397	25.664	78.180

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