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Payment Behaviour to Municipal Service Provision in Bangladesh

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The paper investigates the factors which are believed to influence the behaviour of households' willingness to pay for public services provided by municipal authorities in Bangladesh. The underlying concern of the analysis is a deeper understanding of the factors that are important for revenue mobilisation strategies in the municipalities of Bangladesh. The analysis is based on a survey of over six thousand households across all municipalities of Bangladesh, complemented with administrative data obtained from these local entities. A multinomial logit model is fitted. The model specification groups the household payment responses into three categories, i.e., willing to pay, reluctant to pay and opposed to paying the service charges while controlling for economic, social and demographic factors. The econometric model is estimated for each of three public services, i.e., water supply, solid waste management and street lighting facility, separately. The results indicate that household willingness to pay is significantly affected by factors such as service charge, income, education and the municipal classification. An important policy insight is that service charge increases and other factors noted above can be important in strategies for local revenue mobilisation.

Keywords: Municipality, Service Charge, Water Supply, Solid Waste Management, Street Lighting, Willingness to Pay, Revenue Mobilisation

JEL Classification: H31, H40, R58

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I. INTRODUCTION AND CONTEXT

Bangladesh is undergoing rapid urbanisation. At independence in 1971, barely 8 per cent of the country's total population of 75 million lived in urban areas, while the remaining 92 per cent lived in rural areas, i.e. it was a predominantly rural economy. In 2017, the urban population increased to 36 per cent of the total population of 160 million and is forecast to exceed half the population by 2030. The government has thus prioritized the provision of public services to the municipal councils (*Pourasabhas*) and city corporations of the country, which currently number 332. The government's strategic agenda for the municipalities and city corporations is to achieve sustainable and planned urbanisation, improve the quality of life with emphasis on improving living standards of the poor, improve the quantum and quality of public services and accelerate infrastructure facilities to increase productivity, employment and investment, as well as to enhance institutional and financial capability (7th Five Year Plan 2016-2021).

The government devised a 3-tier classification for the 11 city corporations and 319 municipalities based on the annual revenues they collect during the preceding three years. Revenue collection of class A municipalities exceeds Tk 6 million, that of class B municipalities ranges from Tk. 2.5 to Tk. 6 million, and that of class C municipalities revenue collection is in the range of Tk. 1 to Tk. 2.5 million. The government finances the bulk of the municipal expenditures through budget transfers in the form of block grants, special grants and project grants and the municipalities finance the remaining balance from revenues collected locally through service or user charges, taxes, tolls, fees, and other levies. Local revenue mobilisation of the municipalities ranges from 30 to 60 per cent of total revenue in most cases.

There is a preponderance of the view among economic planners in many developing countries, that the low local revenue collection from charges for public services experienced by local government bodies reflects poor willingness to pay (WTP) by their residents. At the current stage of its development, this view, however, seems contrary to reality, given the rapid rise of incomes and living standards in the urban, peri-urban and rural areas of Bangladesh over the past three decades. Since local revenue mobilisation is important for the fiscal sustainability of the local government entities and the overall fiscal balance of the economy, it is important to deepen our understanding of the factors that influence households' WTP for public services in the municipal areas.

Water supply, solid waste management (SWM) and street lighting are three key public services delivered to the households by the municipalities, and the charges levied on them are important sources of local revenue. The rates which municipal authorities may charge for these services are provided in the government's model tax schedule first issued in 1976. The rate schedule which is currently in force was issued in 2003 and specifies the maximum rate which may be levied for each service. These are 10 per cent, 7 per cent and 3 per cent for water supply, SWM and street lighting facilities, respectively. However, the actual rates charged for the services vary substantially across municipalities. It should be noted that "tax" on public (utility) services stated in the model schedule of the government referred to above is synonymous with "service charge" or "user charge," and hence the three terms are used interchangeably throughout the remainder of the paper.

A striking characteristic of the municipalities is, they are acutely understaffed irrespective of their 3-tier classification, which limits their capacity to deliver public services to the satisfaction of their household client base. A large proportion of positions are vacant in all 3 municipality classes, which, along with a high population density, implies a very low ratio of number of staffs to number of service users (i.e. a high work load per staff). Class A municipalities are the most densely populated,[1] and the ratio of work load for each staff is 1: 1800 service users. The same work load ratios in B and C class municipalities are 1: 916 and 1: 1347, respectively. Another feature of these local government entities is that their public service delivery capacity suffers due to a very limited mandate which governs their roles and responsibilities, and weak coordination between the many government ministries, departments and agencies on which they must depend to implement their mandate. Thus, empowerment of the municipalities through devolution of administrative and fiscal authority to the existing municipalities of the country under the current legal and regulatory framework is still not consistent with the government's aspirations for decentralisation expressed in its planning and policy documents, and thus remains an unfinished agenda.

This study investigates a key aspect of fiscal sustainability—local revenue mobilisation by analysing the factors that influence households' willingness to pay (WTP) for municipal services and draws policy implications from the results. Factors such as location of the household, (i.e., whether the household is inside the

[1] Average population density in class A, B and C is 5,584, 4,643 and 3,708 per square kilometer (calculated from the survey data).

service coverage area), household's satisfaction with the service it receives, affordability of the rates charged, level of education, age of the household head, and household size are expected to influence household behaviour towards WTP for public services. The paper also examines whether there are differences in the WTP for the services due to gender (of the household head) or municipal class, i.e., A, B and C municipalities. The study relies on primary data, obtained from a nationwide survey of 6,634 households and all municipalities of Bangladesh, and extensive econometric analyses to identify the determinants of household payment behaviour in response to higher charges for public services. The economic concept of WTP is used to define the payment behaviour.

Section II provides a review of the literature, section III presents the data and methodology used in the analysis, and section IV presents the summary statistics of the variables and results of the econometric analysis. Finally, section V summarises the results and draws policy implications.

II. SURVEY OF THE LITERATURE

Delivery of services such as SWM, water supply and street lighting are critically important in defining living standards in any city or municipality around the world. Issues regarding such public services have been researched extensively in both developed and developing countries. Determining households' WTP for improved services using the Contingent Valuation (CV) approach constitutes a major part of this literature.

Important research questions addressed in the literature, which are germane to this paper, include "what factors influence households" WTP for improved service delivery plans?" and "what factors influence the maximum amount households are willing to pay for a hypothetical improved plan?"

In most of the studies, Logit or Probit models were used to model the probability of WTP for the proposed plans (e.g. Anjum 2013, Seth, Cobbina, Asare and Duwiejuah 2014, Adepoju and Salimonu 2010, Mary and Adelayo 2014, Addai and Danso- Abbeam 2014, Mustafa, Ahmed and UlHaq 2014, Rollins, Zachariah, Frehs and Tate 1997, Tussupova, Berndtsson, Bramryd and Beisenova 2015, Yunus and Rahman 2015). For example, Anjum (2013) uses a stratified random sample of 500 respondents in a study on Islamabad, Pakistan to measure the WTP of the respondents for improved SWM service and to identify the determinants of WTP. Binary choices (i.e. 'yes-no') were offered for the payment of specific amount per month followed by an open-ended question about the maximum willingness to pay (MWPT). A Logit model was employed to determine the factors affecting WTP (i.e. the probability of paying or not) of the respondents. Then a multiple regression model was estimated to find the actual amount respondents would be willing to pay for the plan. Rollins *et al.* (1997) used a CV methodology and a double-bounded Logit model to identify the determinants of WTP for improved public water supply infrastructure. Yunus and Rahman (2015) estimated the WTP for water supply, SWM, street lighting and property tax in the municipalities of Bangladesh using the BIGD municipal survey (2014 and 2015) data. Using a Probit model, they found service user charges and income of the household to be significant determinants of WTP in all four cases.

Some studies have used the Tobit model to investigate the determinants of the maximum amount households would be willing to pay (MWTP) because the MWTP was not fully observed and it took zero values for a substantial part of the sample (i. e. censoring from below). For example, Hagos, Mekonnen and Gebreegziabher (2012) used a Tobit model for SWM plan where the MWPT was censored from below. Awunyo-Vitor, Ishak and Seidujasaw (2013) did the same. For water quality and supply enhancements, Brox, Kumar and Stollery (1996) used a Tobit model which allowed the WTP to be non-negative. The income, age and number of children in the household were found to be statistically significant determinants of the WTP for better water quality. Willis, Powe and Garrod (2003) used a spike log-logistic model and the CV approach to estimate robust values of the WPT for the service and community benefits of replacing and/or upgrading street lighting.

Hazra, Goel and Maitra (2013) examined public perception towards attributes of SWM in terms of WTP values using a multinomial logit (MNL) model. However, in the presence of heterogeneity in consumption in terms of various socioeconomic characteristics, it is important to understand how these characteristics influence WTP values. From this motivation, Hazra, Goel and Maitra (2015) further analysed the same data set used in Hazra *et al.* (2013) by developing several random parameter logit (RPL) models and assessed the difference between WTP values from the two models and to capture the decomposition effect of socioeconomic characteristics of households on WTP values.

Beaumais, Prunetti, Casabianca, and Pieri (2015) used a rank ordered Logit model to estimate marginal WTP to decrease pollution (i.e. negative externalities) associated with SWM using data from a ranking choice experiment. They found that individuals were not satisfied with the status quo; they were found to be more willing to pay for the reduction of SWM-related negative externalities. They also found that individuals who were aware of the existing fee (only 16 per cent respondents stated that they knew how much they pay for SWM) showed a greater WTP for the reduction of the negative externalities associated with solid waste.

Ku, Yoo and Kwak (2009) attempted to apply choice experiments with regard to the residential waste disposal system in Korea by considering various attributes that were related to the system. Multinomial logit model (MNL) and nested Logit model (NL) were used to estimate the WTP for a clean food-waste collection facility, the collection of small items (such as obsolete mobile phones and add-ons for personal computers), and a more convenient large waste disposal system. Estimates of WTP from the empirical analysis based on multinomial Logit models were quite similar to those of nested Logit models.

This study analyses the households' WTP for improved water supply, SWM and street lighting services. The study uses a contingent valuation approach to assess individual household's WTP for each of the three public services. According to their responses, households were categorised into three different response-groups: (1) willing to pay, (2) reluctant and (3) oppose. With this categorisation of WTP, the study chooses to model the probability of WTP using a multinomial Logit model (MNL). The model is estimated for each of the three services (water supply, SWM and street lighting) provided by the municipalities rather than considering only one, as in most of the studies in the literature. This study further extends the important work of Yunus and Rahman (2015) by providing insights on the quality of municipal services. It also deepens the understanding of how households respond to increases in user charges levied on municipal services. In Bangladesh, it is an area of critical importance to the government's development strategy and policy for rapidly growing urban and peri-urban areas. These concerns have received high priority in the country's 7th Five Year Plan (2016-2020). The paper also contributes to the literature in terms of its wider coverage of public services.

III. DATA AND METHODOLOGY

3.1 The Data

The study uses data from the BIGD municipal survey (2014 and 2015) conducted on households in all municipalities and city corporations of Bangladesh. A second phase of data collection in 2015 was carried out to improve the quality of the data obtained from the municipal offices. The cluster sampling design was used, yielded a sample size of 6,634 (Yunus and Rahman 2015). This involved interviewing 20 holding owners from each municipality in the household survey. As most municipalities comprise 9 administrative wards, the sub-sample of 20 households could be conveniently distributed across the wards, to do about 2 interviews in each ward. However, the number of wards in the city corporations is higher than 9 and, therefore, at least one household from each ward was interviewed. This increased the sample size to 6,752—the 2 municipalities which could not provide the required data were dropped from the sample. All samples for the household survey were drawn randomly. The household survey collected detailed information on sources of household income, WTP for 'better quality' public service provided by the municipalities, reasons for their WTP or reluctance or opposition to it with both open and close ended questions.

Primary data for the study were collected from the municipal offices. These comprised detailed data on revenue collection, expenditure, infrastructure (e.g. road, drain, bridge, culverts, etc.), actual and sanctioned staff in the municipal offices, services delivered, etc.

3.2 Contingent Valuation and Response Categories

The assessment of WTP requires that households (respondents) be asked about whether or not they were willing to pay higher service charges for each of the three public services provided by the municipalities in addition to the current rate paid by them based on an assurance by the latter to provide better services. The paper adopts a 2-step contingent valuation method to assess WTP of the surveyed households (Yunus and Rahman 2014). In the first step, households are asked whether they were willing to pay an increased service charge of 0.2 to 1 per cent (in addition to the current rate) if they were assured of better services (quality piped water, SWM and street lighting facility) by the municipality. Where the respondent household is outside coverage area, e.g., not connected to piped water supply, lacked SWM service or street lighting service, they were asked if they were willing to pay an additional (higher) charge of 0.2 to 1 per cent with the assurance that they would be provided adequate piped water supply, improved SWM service and improved lighting facility by the municipality. In the second step, the respondents were asked about the reasons for their willingness or unwillingness to pay higher service charges. The "unwillingness to pay" respondents were classified into two categories: *"reluctant"* and "*oppose*." Respondents who stated "The service charge is too high" or "I have to pay a number of other service charges" or "I have other cheaper sources available" as reasons for their unwillingness were placed in the *"reluctant*[2]*"* category, while the "*oppose*[3]*"* category comprised respondents who stated "I do not trust the municipal authority" or "Officials of the municipality are corrupt" or "I have heard that the service quality is not good" as reasons for their unwillingness to pay. The respondents who indicated WTP for the proposed plan, at the first step, were placed in the "Willing to pay (WTP)" category. The same three categories ("WTP", "*reluctant"* and "*oppose"*) were used for each service (water supply, SWM and street lighting facility) in the econometric analysis.

3.3 The Model

A multinomial logit (MNL) model was fitted with three alternatives (e.g. WTP, *reluctant* and *oppose*) taking alternative invariant regressors, i.e., the same set of regressors are used for each three categories of the dependent variable.

In the general multinomial model, the utility of alternative j for individual i is specified as

$$U_{ij} = V_{ij} + e_{ij};\ j=1, 2\ldots\ldots m \text{ and } i=1, 2\ldots\ldots N,$$

where V_{ij} is the deterministic and e_{ij} is the random component of the utility. In order to maximize the utility, an individual chooses the alternative that gives him the highest satisfaction. For each category j, the outcome variable Y (i.e. the chosen alternative) is defined as

$$Y_j = \begin{cases} 1 \text{ if } Y = j, \\ 0 \text{ if } Y \neq j. \end{cases}$$

The probability of choosing alternative j is equal to the probability that the utility of alternative j is greater than the utilities of all other alternatives. Therefore,

$$Pr\ (Y_{ij}) = Pr\ (U_{ij} > U_{ik} \text{ for all } k \neq j) = Pr\ (V_{ij} + e_{ij} > V_{ik} + e_{ik} \text{ for all } k \neq j).$$

[2] Households falling in the *Reluctant* category are unwilling to pay mainly because of their budgetary concerns. This study assumes that if they had not been constrained by their budget or if there had not been any cheaper alternative available, they would have agreed to accept the higher payment; because they do not raise issues such as corruption, uncertainty and lack of trust on the municipality. They are *Reluctant* to pay just because they cannot afford the higher payment, or they have a less costly alternative.

[3] Households falling in the *Oppose* category are not concerned about their budget rather they seemed more concerned about corruption, trust and uncertainty or service reliability issues. This study thus assumes that these households would not have paid the higher rates even if they had not been constrained by their budget.

Assuming that errors are identically and independently distributed (iid), the MNL specifies

$$P_{ij} = \frac{e^{(X_i' \beta_j)}}{\sum_{l=1}^{m} e^{(X_i' \beta_j)}} \; ; j=1, 2 \ldots \ldots m,$$

where, X_i are the alternative invariant explanatory variables and β_j are the coefficients for each alternative. The vector $X_i' \beta_j$ is expanded as

$$X_i' \beta_j = X_1\beta_{j1} + X_2\beta_{j2} + X_3\beta_{j3} + X_4\beta_{j4} + X_5\beta_{j5} + X_6\beta_{j6} + X_7\beta_{j7} + X_8\beta_{j8} + X_9\beta_{j9} + X_{10}\beta_{j10} + X_{11}\beta_{j11} + X_{12}\beta_{j12},$$

where X_1 is the current service charge, X_2 is the increase in service charge when responding to the first stage question.[4] That is, $X_1 + X_2$ equals the offered rate. X_3, X_4 and X_5 represent each household's annual income, age of the owner of holding, and education (measured as the total number of years of schooling of the owner of the holding) respectively. X_6 is a measure of tax evasion[5] and X_7 represents household size (total members in a household). X_8 is a dummy variable for class A which takes a value of 1 if the class is A and 0 otherwise. Similarly, X_9 is 1, 0, otherwise in case of the dummy variable for class B the gender dummy X_{10} takes a value of 1 if the holding owner is male and 0 otherwise. The coverage dummy X_{11} takes the value of 1 if the household receives a particular service and 0 otherwise. X_{12}, the dummy variable for high service charge, takes 1 if the offered rate exceeds 10, 7 and 3 for water, SWM and street lighting, respectively, and 0 otherwise.

Since Y_j is 1 if alternative j is observed (i.e. the remaining $Y_k = 0$), for each observation on Y,exactly one of Y_1, $Y_2 \ldots$,Y_m will be nonzero. Therefore, the multinomial density for one observation can be written as:

$$f(Y) = P_1^{Y_1} \times \ldots \ldots . . \times P_m^{Y_m} = \prod_{j=1}^{m} P_j^{Y_j}$$

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[4]First stage question: "Would you be willing to pay an increased service charge for the proposed plan or not?" Second stage question (asked only to the respondents who showed unwilling to pay in the first stage): "What is (are) the reason (s) for your unwillingness?"

[5]Measured as $(total\ taxliability - total\ tax\ payment)/total\ tax\ liability$. Here, 'tax' refers to service charge.

and the likelihood function for N independent observations is

$$L_N = \prod_{i=1}^{N} \prod_{j=1}^{m} P_{ij}^{\,Y_{ij}}.$$

Therefore, log likelihood function in maximum likelihood estimation becomes:

$$log(L) = \sum_{i=1}^{N} \sum_{j=1}^{M} Y_{ij} ln\left(P_{ij}\right) \text{ ; Where } P_{ij}=F_j(X_i, \beta).$$

The WTP category is considered as the base category in the MNL regressions and therefore, marginal effects of regressors would, in fact, be the marginal probabilities of moving to either the "r*eluctant"* or *"oppose"* categories from the WTP category.

A limitation of the MNL model is that discrimination among the *m* (*m* equals 3 in this paper, namely WTP, *reluctant* and *oppose*) alternatives reduces to a series of pair wise comparisons (e.g. WTP vs *reluctant*, WTP vs *oppose*) that are unaffected by the characteristics of other alternatives. Since the conditional probability of any two alternatives does not depend on any other alternative, the MNL model reduces to a binary logit model between the pair of choices under consideration (Cameron and Trivedi 2005). That is, the MNL model holds only under the assumption that a person's choice between two alternative outcomes is independent of what other choices are available. This assumption is known as the Independence of Irrelevant Alternatives (IIA). In our case, we assume that all three categories are mutually independent, i.e., that the relative risk associated with the WTP and *reluctant* categories is not affected by the inclusion or exclusion of *oppose* category and the relative risk associated with the WTP and *oppose* categories is assumed to be unaffected by the inclusion or exclusion of *reluctant* category.

A number of tests may be used to test the validity of IIA assumption. Hausman and McFadden (1984) proposed a Hausman test which compares between the full MNL model (i.e. estimated with all outcomes/alternatives) and a restricted model that includes only some of the outcomes, where under the null hypothesis,[6] the coefficients of the full model are consistent and efficient, and coefficients of the

[6]H_0: difference in coefficients not systematic/ the IIA assumption satisfied.

H_1: difference in coefficients systematic/ the IIA assumption violated.

restricted model are consistent but inefficient. Statistical significance of the Hausman test statistic (H)[7] indicates the violation of IIA assumption.

However, the Hausman test has at least two major limitations. First, the test may be undefined if the variance (of the difference of the estimates) matrix does not meet the asymptotic assumption of the test. In such a case, the test statistic H takes a negative value.[8] Second, the test relies on the availability of a fully efficient estimator, which may not be the case always. An alternative test of the IIA assumption, which improves on the limitations of the Hausman test, is the seemingly unrelated estimation. The first advantage of this approach is that the test is always well defined.[9] Second, it allows estimation of the variance-covariance matrix of the multivariate normal distribution of the estimators of full and restricted models and test of equality of common coefficients. This study conducts both the Hausman test and seemingly unrelated estimation to test whether or not the IIA assumption is violated.

IV. ECONOMETRIC ANALYSIS

4.1 Summary Statistics

After discarding the city corporations due to problems of data, we took 319 municipalities (109, 123 and 87 from class A, B and C, respectively) as the study sample. The number of households surveyed varies for each of the public services. The sample sizes were 4,840, 4,914 and 4,031 households in water supply, SWM and street lighting, respectively. The MNL regressions in the study were estimated for each of the three public services. Appendix Tables A.1 and A.2 show the mean values of the independent variables in the regressions by three categories of the dependent variable (WTP, *reluctant* and *oppose*). And, percentage distributions of

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[7] Hausman test statistic $H = \left(\widehat{\beta^r} - \widehat{\beta^f}\right)'\left[\widehat{Var}\left(\widehat{\beta^r}\right) - \widehat{Var}\left(\widehat{\beta^f}\right)\right]^{-1}\left(\widehat{\beta^r} - \widehat{\beta^f}\right)$, where $\widehat{\beta^r}$ and $\widehat{\beta^f}$ are estimated coefficient matrices of the full and restricted models, respectively and $\widehat{Var}$ represents respective estimates of variance matrices. H is asymptotically distributed as chi-square with *df* = number of rows in $\widehat{\beta^r}$.

[8] H becomes negative when $\widehat{Var}\left(\widehat{\beta^r}\right) - \widehat{Var}\left(\widehat{\beta^f}\right)$ fails to meet the asymptotic assumption of Hausman test (i.e. not positive semidefinite). Such a case refers to an undefined Hausman test. However, Hausman and McFadden (1984) explain this as evidence that the IIA assumption holds.

[9] The variance (of the difference of the estimates) matrix estimated as $\widehat{Var}\left(\widehat{\beta^r}\right) - \widehat{Cov}\left(\widehat{\beta^r}, \widehat{\beta^f}\right) - \widehat{Cov}\left(\widehat{\beta^f}, \widehat{\beta^r}\right) + \widehat{Var}\left(\widehat{\beta^f}\right)$ is always admissible.

the three payment categories across each of the three services and municipal class are provided in Appendix Tables A.3 and A.4.

Regression Results

(i) Water Supply

Appendix Table A.5 shows the results of MNL regression for water supply service. The results indicate that a one per centage point increase in the current service charge for water supply paid by households increases the probability of their moving from the being willing to pay (WTP) to being opposed to pay (*oppose* category) by 1.4 per cent; the result is statistically significant at the one per cent error probability level. Changes in the incremental charge (offered charge minus current charge) also affects the probability of being reluctant or opposed to pay (*reluctant* or *oppose* category) positively. The age of the household head positively affects the probability of moving to the *reluctant category*, but the probability of moving to the *oppose* category is affected negatively, i.e. households with older heads are more likely to be *reluctant* but they are less likely to *oppose*. An additional year of schooling of the household head decreases the probability of being *reluctant* by 0.6 per cent and the probability of opposing by 0.2 per cent. Households residing in A and B municipalities are less likely to be *reluctant* or *opposed* to paying higher service charges. Being in class A and B reduces the probability of opposing by 1.5 per cent and 1.7 per cent, respectively compared with what the probability would be if they resided in other municipalities (B and C in the case of A and A and C in the case of B). The service coverage dummy is significant with a positive sign; households within the coverage area are more likely to fall in the *reluctant* category and vice versa. Households receiving the water supply service are 6.7 per cent more likely to be *reluctant* to pay the increased charge than the households which are not receiving the service. The high service charge dummy is significant with negative sign, which indicates that if the offered service charge (current plus increase) exceeds 10 per cent, then the households become less likely to *oppose*. This finding may seem counterintuitive but, in reality, it needs not be, because it is difficult for tax evaders to openly acknowledge their unwillingness to pay higher charges. In other words, they may well be motivated not to reveal their actual intent. This finding is also consistent with the sample characteristic stated above, that highest proportion of tax evading households were in the *oppose* category (Tables A.1 and A.2). Gender of the household head and the size of the household do not significantly affect the WTP.

(ii) Solid Waste Management (SWM)

The marginal effects of current and incremental rate were statistically insignificant for both the *reluctant* and *oppose* categories (see Table A.6). Although by a small margin, households having higher income are less likely to be *reluctant* to pay more. Effect of age on the WTP is similar to that in the case of water supply; households with older heads are more likely to be *reluctant* but less likely to *oppose*. The number or years of schooling negatively affects the probability of being *reluctant* or *oppose*, e.g. one additional year of schooling decreases the probability of 'opposing' by 0.23 per cent. Larger households are less reluctant to pay; an additional member in the household decreases the probability of being reluctant to pay more by 0.8 per cent. Households in A municipalities are 2.7 per cent less likely to *oppose* the payment relative to households in B or C municipalities. The probability of a household in B municipalities becoming *reluctant* to pay is 8 per cent lower than the households in A or C municipalities. And, probability of a household in B being opposed to pay more is 3 per cent lower than the households in A or C. The coverage dummy negatively affects the probability of WTP; households already receiving the service are 3.1 per cent less likely to be *reluctant* to pay more relative to households outside the coverage area. As in the case of water supply, no significant effect of gender differentials among household heads is found and the high service charge dummy is insignificant.

(iii) Street Lighting

A 1 per cent increase in current service charge increases the probability of a household to oppose to pay more by 2 per cent compared to the probability of being willing (Table A.7). Household heads with better education (in terms of the years of schooling) and higher income are less likely to be reluctant or oppose the higher payment. For example, one additional year of schooling decreases the probability of being reluctant to pay by 0.2 per cent and the probability of being opposed by 0.2 per cent compared to the probability of being willing. The marginal effect of tax evasion shows that households with higher tax evasion rates are less likely to be reluctant to pay more. The seeming counter intuitiveness can be explained by tax evading behaviour of the households as noted above in the case of the high service charge dummy in water supply. Households with an additional member in the household are less likely to be reluctant to pay more for street lighting services; in this case the, probability is 1.27 per cent less. Also, households residing in class A and B municipalities are less likely to be reluctant or opposed to paying more.

For example, being in class A and B reduces the probability of opposing by 3.7 and 4 per cent, respectively compared to the probability that would be if they were in other classes. The coverage dummy is highly significant with a positive marginal effect for the *reluctant* category, i.e., households who already have lighting facilities on their streets are more likely to be *reluctant* to pay more and vice versa. The high service charge dummy, as in the case of water supply, has a significant negative effect for those households opposed to paying more, which indicates that if the offered rate (current plus increase) exceeds 3 per cent then the households are less likely to *oppose* the payment. This finding is similar to the case of the same variable in water supply service and, as stated above, reflects the tax evading behaviour of households.

The Hausman test and the seemingly unrelated variables estimation to check the validity of the independence of irrelevant alternatives (IIA) assumption indicated that both tests are satisfied in all the econometric results above with one exception. In the case of the *oppose* category in water supply services, the later test was not satisfied. In other words, it is unclear whether those who are opposed to paying higher service charges will continue to do so if they are given options in addition to being WTP or reluctant to pay more. Details of the tests are provided in the appendix (Tables A.8 and A.9 and the subsequent explanation).

V. SUMMARY AND CONCLUSION

The central concern of the paper is to identify factors which influence the payment behaviour of households when faced with options to pay current and additional service charges for key public services provided by municipalities in Bangladesh. Payment behaviour is specified as the probability of household being WTP, reluctant or opposed to paying the current and additional service charges.

In general, the results imply that in the case of water supply, the current service charge, the incremental charge and service coverage (dummy) negatively influence the probability of willingness to pay (WTP). The number of years of schooling of household heads and high service charge (dummy) positively influence the probability of WTP. Also, being in class A and B municipalities positively influence the probability of willingness to pay.

The implications of the results for solid waste management (SWM) are that household income, education of household head, household size and service coverage (dummy) positively influence the probability of WTP. Also, being in class A and B municipalities positively influences the probability of willingness to pay. The current charge was not a statistically significant predictor of the probability of willingness to pay.

The implications for street lighting service are that the current rate of service charge, male headed households and service coverage negatively influence the probability of WTP. Household income, education of household head and household size positively influence the probability of WTP. Also, being in class A and B municipalities positively influences the probability of willingness to pay.

The results provide some important insights for policy. There is room for government to increase current service charges for all the three services. Although this reduces the willingness to pay the higher charge and additions to it, this is not a concern since household incomes positively influence the probability of willingness to pay. Budget allocations for education in the municipal areas should continue to be prioritized since it positively influences the probability of willingness to pay. Thus, greater education among households increases the local revenue potential. As a corollary to the effect of the years of schooling on the probability of willingness to pay, government policy should also target public awareness of the need to pay more for better service delivery. Finally, since the results indicated a greater probability of the willingness to pay in municipal class A and B, which provide better public services and have greater service coverage areas, public policy may target rate increases for the three public services in the two municipal classes.

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APPENDIX

TABLE A.1

MEAN VALUE OF THE EXPLANATORY VARIABLES ACROSS CATEGORIES OF THE DEPENDENT VARIABLE

Variables	Services					
	Water Supply			SWM		
	WTP (n= 317)	*Reluctant* (n= 1420)	*Oppose* (n= 243)	WTP (n=3123)	*Reluctant* (n= 1433)	*Oppose* (n= 358)
Current rate (%)	1.94	1.61	1.80	4.67	4.88	4.50
Increase (%)*	7.36	7.92	7.87	1.71	1.70	1.42
Income (thousand Tk)	440.06	372.09	330	454.71	347.37	337
Age (years)	51.16	52.13	49.32	51.13	52.14	50.37
Education	8.37	7.72	7.19	8.53	7.44	7.30
Tax Evasion	0.86	0.85	0.88	0.86	0.86	0.88
Household size	4.72	4.65	4.61	4.72	4.63	4.68
Class A	0.40	0.41	0.37	0.40	0.42	0.38
Class B	0.42	0.35	0.36	0.42	0.34	0.36
Gender(male=1)	0.93	0.94	0.95	0.93	0.94	0.94
Coverage	0.23	0.23	0.20	0.30	0.26	0.26
High service charge	0.80	0.83	0.82	0.68	0.73	0.56

Note: *refers to offered rate minus the current rate.
n represents sample size, i.e. number of households in each category.

Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.2

MEAN VALUE OF THE EXPLANATORY VARIABLES ACROSS CATEGORIES OF THE DEPENDENT VARIABLE

Variables	Street Lighting		
	WTP	*Reluctant*	*Oppose*
	(n= 3166)	(n= 626)	(n= 239)
Current rate (%)	2.21	2.49	2.24
Increase (% point)	1.21	0.96	1.06
Income (thousand Tk)	441.25	382.89	311.53
Age (years)	51.20	51.90	50.54
Education	8.20	8.06	7.02
Tax Evasion	0.86	0.85	0.87
Household size	4.75	4.47	4.74
Class A	0.38	0.53	0.33
Class B	0.43	0.24	0.32
Gender (male=1)	0.93	0.94	0.94
Coverage	0.54	0.65	0.47
High service charge	0.87	0.89	0.74

Note: n represents sample size, i.e. number of households in each category.
Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.3

PERCENTAGE DISTRIBUTION OF PAYMENT CATEGORIES

Category	Water supply	SWM	Street lighting
WTP	62.72	60.67	76.14
Reluctant	31.87	31.34	16.38
Oppose	5.41	7.99	7.48
Total	100	100	100

Source: Authors' estimate based on BIGD Municipal Survey

TABLE A.4

CLASS-WISE PERCENTAGE DISTRIBUTION OF PAYMENT CATEGORIES

Class	Water supply		SWM		Street lighting	
	WTP	UTP*	WTP	UTP	WTP	UTP
A	63.85	36.15	61.55	38.44	72.62	27.37
B	67.15	32.85	65.46	34.55	82.78	17.22
C	54.66	45.34	52.35	47.66	71.52	28.49

Note: *Households falling in either *Reluctant* or *Oppose* category are called 'Unwilling to pay (UTP).

Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.5

MARGINAL EFFECTS ESTIMATED BY MNL REGRESSION OF WILLINGNESS TO PAY FOR IMPROVED WATER SUPPLY SERVICE

Regressors	Category			
	Reluctant		Oppose	
Current water rate (%)	.0014	(.0077)	.0141***	(.0034)
Increase (% point)	.0128*	(.0078)	.0144***	(.0033)
Income	-1.93e-08	(.0000)	-9.26e-09	(.0000)
Age (years)	.0012***	(.0005)	-.0007***	(.0002)
Education	-.0059***	(.0015)	-.0022***	(.0006)
Tax Evasion	-.0344	(.0380)	.0265	(.0172)
Household size	-.0065	(.0040)	-.0001	(.0015)
Class A	-.0271	(.0194)	-.0156*	(.0083)
Class B	-.0935***	(.0167)	-.0173***	(.0068)
Gender (male=1)	.0195	(.0264)	.0114	(.0103)
Coverage	.0674***	(.0220)	-.0041	(.0092)
High service charge (> 10%)	-.0126	(.0562)	-.1598***	(.0653)

Note: Robust standard errors are in parentheses and ***, ** and * indicate statistical significance at 1, 5 and 10 per cent levels, respectively.

Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.6

MARGINAL EFFECTS ESTIMATED BY THE MNL REGRESSION OF WILLINGNESS TO PAY FOR IMPROVED WASTE MANAGEMENT SERVICE

Regressors	Category			
	Reluctant		Oppose	
Current SWM rate (%)	.013	(.0094)	-.0028	(.0038)
Increase (% point)	.007	(.0097)	-.0053	(.0042)
Income	-4.29e-08*	(.0000)	-9.11e-09	(.0000)
Age (years)	.0012*	(.0005)	-.0005***	(.0003)
Education	e-.0094**	(.0015)	-.0023***	(.0008)
Tax Evasion	-.0319	(.0388)	.0286	(.0210)
Household size	-.0077*	(.0040)	.0001	(.0019)
Class A	-.025	(.0189)	-.0272***	(.0090)
Class B	-.0795***	(.0173)	-.0300***	(.0085)
Gender (male=1)	.0312	(.0258)	.0055	(.0138)
Coverage	-.0310**	(.0149)	-.0018	(.0086)
High service charge (>7%)	.0220	(.0374)	-.0212	(.0183)

Note: Robust standard errors are in parentheses and ***, ** and * indicate statistical significance at 1, 5 and 10 per cent levels, respectively.
Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.7

MARGINAL EFFECTS ESTIMATED BY THE MNL REGRESSION OF WILLINGNESS TO PAY FOR IMPROVED STREET LIGHTING FACILITY

Regressors	Category			
	Reluctant		*Oppose*	
Current street lighting rate (%)	.0211	(.0163)	.0209***	(.0084)
Increase (% point)	-.0030	(.0158)	.0112	(.0086)
Income	-7.68e-09	(.0000)	-1.87e-08**	(.0000)
Age (years)	.0005	(.0004)	.0002	(.0002)
Education	-.0024**	(.0011)	-.0022***	(.0007)
Tax Evasion	-.0943***	(.0291)	.0086	(.0204)
Household size	-.0127***	(.0035)	.0011	(.0017)
Class A	-.0203	(.0154)	-.0375***	(.0085)
Class B	-.1058***	(.0143)	-.0404***	(.0078)
Gender (male=1)	.0346 ***	(.0192)	.0028	(.0132)
Coverage	.0442***	(.0119)	-.0093	(.0075)
High service charge (>3%)	.0122	(.0244)	-.0992***	(.031)

Note: Robust standard errors are in parentheses and ***, ** and * indicate statistical significance at 1, 5 and 10 per cent levels, respectively.
Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.8

HAUSMAN (CHI-SQUARE) TEST STATISTIC AND P VALUE

Services	Exclude *Reluctant*		Exclude *Oppose*	
	Chi-square	P value	Chi-square	P value
Water supply	1.01	1.00***	0.27	1.00***
SWM	-2.31	---	-0.6	---
Street lighting	0.55	1.00***	1.37	0.99***

Note: *** indicates that the IIA assumption is satisfied.
Source: Authors' estimate based on BIGD Municipal Survey.

TABLE A.9

CHI-SQUARE TEST STATISTIC AND P VALUE FROM SEEMINGLY UNRELATED ESTIMATION

Services	Exclude *Reluctant*		Exclude *Oppose*	
	Chi-square	P value	Chi-square	P value
Water supply	23.14	0.04	12.17	0.43***
SWM	20.92	0.07***	19.09	0.08***
Street lighting	16.46	0.22***	17.69	0.17***

Note: *** indicates that the IIA assumption is satisfied.
Source: Authors' estimate based on BIGD Municipal Survey.

Results of the Hausman test provide evidence of the non-rejection (P value>0.05) of the null hypothesis that the IIA assumption is satisfied for both restricted equations (one excluding the *reluctant* category and the other excluding the *oppose* category) in the case of water supply and street lighting services (see Table A.9). In other words, in indicating *WTP*, when households are given 2 options, e.g. *WTP* or *reluctant*, households' preference for *WTP* would not change even if a third option, e.g. *oppose*, is introduced. Further, the choice of WTP will hold irrespective of any number of options that may be provided. Thus, in indicating any one of the three options, households reveal a strong preference for their behaviour. However, the test turned out to be undefined for the SWM service, which is not surprising; a negative chi-square value indicated when the variance matrix does not meet the asymptotic assumption of the Hausman test.

Moving on to the test results from the seemingly unrelated estimation, designed to overcome the shortcomings of Hausman test, in SWM service, the P values of the respective chi-square test statistics (P value>0.05) from the seemingly unrelated estimation of both restrictions indicate that the null hypothesis the IIA assumption is satisfied, thus cannot be rejected. The same is true for street lighting; high P values (P value>0.05) associated with both restrictions confirm the validity of the IIA assumption. Although satisfied according to the Hausman test, the IIA assumption is violated in the case of water supply when the *Reluctant* category is restricted from the model (P value<0.05). This result suggests that the probability of a household of falling in either WTP or the *oppose* category might be affected by the exclusion of the *reluctant* category according to the seemingly unrelated estimation. However, the IIA assumption is satisfied when the *oppose* category is restricted.