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In gov we trust: the less we pay for improved electricity supply in Ghana

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Abstract

Background: Ghana is bedeviled with the lack of 24-h supply of electricity. This holds back economic growth and sustainable development prospects. Several studies have investigated varied factors that account for household's willingness-to-pay (WTP) for improved electricity services. However, not much is known about the role of trust as a proxy for social capital and household's WTP for improved electricity services. We hypothesize that trust (social capital) is a key factor in determining households WTP for a 24-h supply of electricity in Ghana, a service which is largely controlled by the government.

Methods: This study uses primary data collected in a survey of households and applies the well-known and widely used Contingent Valuation Method (CVM) to estimate how much households who trust and those who do not trust in the government are willing to pay for a 24-h supply of electricity.

Results: We have evidence that trust in the government is statistically significant and varies negatively with WTP for improved electricity supply. In line with our hypothesis and the few existing studies on trust-WTP relationship, we conclude that trust plays a key role in determining WTP for improved electricity services in Ghana. Our estimates which are downward biased constitute 15–17% of household's income.

Conclusions: To advance the course of generating funds to sustain the supply of a 24-h supply of electricity, this study argues based on the evidence from the trust-WTP relationship that most households do not trust the government in the provision of efficient electricity services. Those who trust the government are currently not willing to pay more for an improved electricity service because they believed the promises made to them by politicians that they would be provided with an improved service without them having to pay more. We recommend that government (politicians) should not trivialize anything that bothers on trust as it is not without its associated consequences on consumer's WTP behaviour. Secondly, for efficient provision of improved electricity supply, policymakers should commence educating citizens on the unsustainability of government's provision given its limited budget and explore private sector options.

Keywords: Contingent Valuation Method, WTP, Social capital, Trust, Electricity

Background

Lack of access to basic utilities or social services such as electricity and water which are largely controlled by the government inhibits growth and development and perpetuate millions in extreme poverty. In most African countries, citizens largely depend on the government for the provision of the majority of social services. This over dependency has been attributed to household's low levels of income and standard of living. Africa constitutes a greater fraction of the 800 million people who currently live on less than $1.25 a day. The lack of basic social services in Africa is quite alarming. For example, out of the estimated 1.4 billion people around the world who lack access to electricity (see [1]), 95% are either in Africa or Asia. Furthermore, it has been reported by the World Bank [2] that 25 African countries including Ghana still experience blackouts. In Ghana, particularly the Greater Accra Region (GAR), urban and rural household access to electricity supply is estimated at approximately 83 and 22%, respectively (see [3]). Dating back to about a decade now (i.e. 2006–2016), electricity supply has been very erratic. In the last quarter of 2016 (until January 2017), supply has been relatively stable. However, experts believe that a permanent solution has not

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yet been reached probably because of the current energy mix with its accompanying huge distributional losses and inadequate funding. Apart from presenting a high level of uncertainty and risk to businesses and household planning needs, this puts doubts on Ghana's ability to meet the Sustainable Development Goal 7[1] by 2030.

Factors that repose some degree of citizens' trust in government include the historical role or practices of governments as well as their record in fulfilling political promises. Some studies (see [4, 5]) have found that citizens' trust highly influences their WTP for projects. However, if the governments have reneged on their promises, Phelan [6] acknowledges that the level of trust falls, in that, citizens will consider such governments as having a higher probability of repeating their dishonesty. Thus, one can expect a positive relationship between governments' improved responsiveness and citizens' preferences and trust [7].

Several authors which include Putnam [8], Narayan and Cassidy [9], and Woolcok [10] have provided several dimensions of social capital. Given the controversies and complexities surrounding the concept of social capital and its measurement (see [11]) especially in developing countries, and for simplicity in disaggregating the WTP variable, we use trust in an institution (government) as a conservative definition of social capital. Hence, we define trust in line with Gambetta [12], Bhattacharya, et al. [13], and Oh and Hong [4] as "a particular level of subjective probability with which agent assesses whether another agent will perform a particular action". In relation to this study, trust is the household's probability assessment of the government's provision of services, say electricity. That is, if the government can fulfill its promises to citizens regarding the provision of services, then we expect the citizens to trust the government—this we define as the trustworthiness of the government. On the other hand, if the government fails to honour its promises then we expect citizens to distrust the government—this we define as the untrustworthiness of government.

Trust as a social capital is a key in determining people's WTP for utilities such as electricity. Oh and Hong [4] concluded that trust is a key factor in determining WTP. Following on this conclusion, this study seeks to investigate the extent to which trust in the government by citizens influences their WTP for improved electricity which is largely owned and controlled by the government. In line with theoretical underpinnings, we hypothesize that trust in the government (social capital) would influence households' WTP for a 24-h electricity service in Ghana. We achieve our objective using the contingent valuation method (CVM) which is a stated preference method used in eliciting information on respondents' WTP. In line with Oh and Hong [4], our results reveal that trust as a social capital plays a key role in determining WTP for improved electricity supply. Contrary to the trust-WTP-positive relationship, we have evidence to argue that in some cases, for example, where services are owned and controlled by the government, the trust-WTP relationship can be negative. In addition, we find that those who trust and distrust the government are willing to pay about GHS 66.78 and GHS 69.76 per month for improved electricity supply, respectively. These amounts constitute between 15 and 17% of household income.

Empirical literature

Several methods exist for economic valuation of resources which include, but are not limited to, hedonic price (HPM), travel cost (TCM), choice experiment (CE) and CVM. The latter is acclaimed to be very useful, meaningful and most popular for economic valuation [14]. Trust in the government may have a significant role to play in a household's WTP decisions. However, there exists a paucity of literature on this relationship; hence, this study contributes in filling this gap especially for developing countries. We present some of the few studies in CVM research that sought to establish this relationship and not necessarily the estimated values.

In the case of developing countries, Abdullah and Jeanty [15] used CVM to examine the WTP for rural electrification in Kenya, particularly, Kisumu district. A nonparametric and a parametric model were employed to estimate WTP values for two electricity products; Grid Electricity (GE) which is largely provided by Government and Photovoltaic (PV) electricity which is provided by both government and other private service providers. It was evidenced that households' trust in the service providers is an important factor in the supply of the electricity. Mistrust of government by the households favour private providers in terms of WTP for both electricity products. Thus, willingness to pay less for the government provision of a service suggests a willingness to pay more for private sector provision of the services.

Most of the trust-WTP evidences can be found in empirical studies from developed countries. One such key research on this relationship was authored by Oh and Hong [4]. Although their approach was theoretical, they sought to investigate the extent to which trust determines citizens' WTP for a public project. They used the Hicksian compensating variation method and citizen's subjective view on subjective perspective of the trust of the government, to find out Korean citizens' willingness to pay for public projects based on the trustworthiness of the government. Their study found a positive relationship between the citizens' trust in the government and their willingness to pay; hence, a public project can be delayed by citizens' distrust towards the government.

Similarly, the issue of trust in government has also been found in a study conducted in the USA. Between

the government and private suppliers of renewable energy technologies; Wiser [14] estimated WTP for 1574 individual households to determine their preferred supplier based on trust. They showed that the respondents were willing to pay more if the money was to be paid to the private suppliers (the agent of trust) than to the government (the agent of mistrust). WTP was also higher in terms of compulsory payments than voluntary payments, indicating that there is a tendency of free riding if individuals are not obliged to pay.

Krystallis and Chryssohoidis [16] sought to find out the factors that influence the WTP for organic products. In the city of Athens in Greece, consumers were asked about their awareness of the term "organic" and to state the factors that influence them when buying such food. Factor analysis in addition to t value analysis was employed to examine if there is a statistical difference in product category between those who are willing to pay and those who are unwilling to pay in terms of factors influencing their purchases. It was found that consumers stated WTP and strength of factors that affect it differ in terms of the category of the organic food. "Trust", "food quality and security" were the only major factors affecting WTP.

Within the European Union, Nocella et al. [17] used CVM and administered a questionnaire among five European countries to find out how consumers were willing to pay for animal-friendly products (AFP). The questionnaire was administered to elicit information from the consumers in terms of their knowledge regarding breeding systems, trust towards operators along the chain of animal-friendly-products, WTP for certified animal-welfare products and other socio-economic characteristics. Since there is a high cost providing certified AFP through its supply chain, the role of trust in the producers played an important part in consumers' willingness to pay for the AFP. Consistent with a priori expectations, the results from their study showed that WTP estimates depend largely on the consumer trust for certified AFP.

Haile and Slangen [5] used CVM to evaluate the willingness to pay for the benefits of Agri-Environmental Schemes (AES) by households living in Winterswijk, the Netherlands. The households were asked to state their WTP values for land use benefits within the AES which is provided by farmers. A two-step Heckman selection technique as well as one equation OLS was employed to estimate WTP values. Estimated results indicated that WTP depends positively on the level of trust as well as the membership status of households towards the environmental organizations.

A review of the literature reveals a paucity of studies on the impact of trust in the government on WTP. In developed countries' empirical studies, trust is normally not treated as the variable of interest; hence, less focus is placed on the issue of trust in WTP studies. That notwithstanding, the information gap is more acute in the case of developing countries. Our present study contributes to the literature and helps in bridging this gap in relation to the subject in question.

Methods

Theoretical framework

Following Loureiro and Umberger [18], we present the theoretical framework for this study based on McFadden's [19] Random Utility Model (RUM). We describe our household as a consumer to better fit our perspective vis-à-vis the general consumer model. The consumer's utility function that is homogenous of degree zero in income and the other choice determinants is simplified as:

$$U = U(x, z, m) \tag{1}$$

From Eq. 1, we assume that the consumer obtains some level of satisfaction from consuming electricity services, x (x_1 as improved and x_0 as the status quo) in addition to composite good, z. The consumer's utility resulting from electricity usage and the consumption of other composite good is constrain by his/her income (m), given the market prices of the goods and services. In other words, consumer's utility is subjected to a budget constraint. Therefore, we express consumer's utility arguments as:

$$U(0, x_0, z, m) \leq U(1, x_1, z, m-\tau) \tag{2}$$

where τ represents the amount of consumer's income he is willing to pay for improvement in electricity services. Equation 2 shows that consumer's utility for having improvement in electricity supply is at least equal to the status quo. By implication, the rational consumer will be willing to pay more (or at least an equal amount) for the improved service because of higher (or equal) utility relative to the status quo. We acknowledge that from the researcher's point of view, the consumer's utility function is unknown given the fact that it has both observable and random components (ε). The latter is assumed to be independently and identically distributed with a mean of zero. Given this, we now represent the utility function in its deterministic and unobservable components in a linear form as:

$$U(x, z, m) = V(x, z, m) + \varepsilon \tag{3}$$

Following this decomposition, we present consumer's decision regarding his willingness to pay as:

$$V(0, x_0, z, m) + \varepsilon_0 \leq V(x_1, z, m-\tau) + \varepsilon_1 \tag{4}$$

From Eq. 4, we posit that the maximum amount of income the individual is willing to forgo in order to enjoy improved electricity supply should maximize

consumer's welfare. Given that our empirical model will follow a probability framework, we represent Eq. 4 in a probability framework:

$$P(WTP \geq \tau) = P(V_0 + \varepsilon_0 \leq V_1 + \varepsilon_1) = P(\varepsilon_0 - \varepsilon_1 \leq V_1 - V_0) \quad (5)$$

Data

Given the goal of the study, we used the contingent valuation survey method to determine the extent to which trust in government influences WTP for improved (24-h) electricity supply in the GAR of Ghana. This region was chosen because it is one of the most populated and fast-growing metropolis in Africa with perennial shortfalls in the supply of electricity services.

Six communities within the ten districts of the GAR were randomly selected. The household survey was carried out using the stratified random sampling technique. These probability sampling techniques were employed for proper representation of the target population. The Yamane [20] sample size computation formula was used to determine the sample size of the study. This was to ensure that possible sample size biases associated with studies of this nature do not occur. The data was obtained using direct face-to-face interviews as this is considered most reliable for CVM studies (see [21]). In instances where respondents failed to participate in the survey, the next available household was used. In all, a total of 514 households were interviewed from February to March 2015.

A CVM training manual was developed by the researchers following standard guidelines provided in Whittington [22, 23]; Bateman et al. [24] and Wedgwood and Sansom [25]. The manual was used to train ten enumerators and three experienced supervisors who were subsequently assessed during the pilot survey before being included in the final list of fieldworkers. The supervisors were assigned a supervisory role over the enumerators to ensure credibility in the data collection process.

The enumerators were tasked to brief respondents on the purpose of the study, thus evaluating the improved (24-h) supply of electricity hence not politically or public institutionally motivated. This is very useful because it disabuses respondents' minds on ulterior motives in giving responses. Indeed, this was meant to keep the focus of responses intact on credible responses. This prevented the possibility of respondents either overstating or understating their WTP values. The questionnaire was designed to include three main sections, namely, respondent's socio-economic data, general utility-related information, and willingness-to-pay for electricity questions. In the "Background" section, bio-data focuses on information about household socio-economic characteristics of respondents. "Empirical literature", utility-related questions presented included access to electricity, current bills and other behavioural questions. In the "Theoretical framework", hypothetical WTP questions were asked using the dichotomous choice and open-ended format.

The randomized starting point amounts were formed following the pilot survey and researchers' common knowledge of electricity bills paid by households within the district of the study region. This process of randomizing the starting point amount was meant to control for the degree of starting point bias or anchoring effect in the WTP values.

The key WTP question asked was: "*Assume your household is provided with 24-hour electricity supply, how much would your household be [at maximum] willing to pay per month?*". The respondent is then shown the randomized starting point amount to indicate either a yes or a no response. After the dichotomous choice questions, the respondent is given an open-ended question to state the maximum amount he/she will be willing to pay for 24-h electricity service at the final stage of the bidding game. In line with Amoah [26], four WTP arguments were observed which follow four definitions.

Thus, for a

- Yes-Yes definition: $WTP_i^* \geq b^u$
- Yes-No definition: $b^o \leq WTP_i^* < b^u$
- No-Yes definition: $b^l \leq WTP_i^* < b^o$
- No-No definition: $WTP_i^* < b^l$

Where b^u is the upper bid, b^o is the starting bid and b^l is the lower bid.

The trust question asked IN THE SURVEY was "*do you have trust in the Government [i.e. people in Government] in facilitating the provision of a 24-hour supply of electricity?*". The respondents were provided with a 'Yes', 'No', 'Unsure' and 'Don't know' options to choose. The trust dummy was used to disaggregate the final open-ended WTP amounts. We admit that our trust variable is limited given the various trust dimensions proposed in literature. Nonetheless, the conservative trust variable was used to obtain the mean-WTP values for those who trust and do not trust the government.

Econometric modeling We use the dichotomous choice WTP responses as our outcome variable. We resort to a discrete choice probit model specified as:

$$y_i = \begin{cases} 1 & \text{if alternative Yes is chosen} \\ 0 & \text{if alternative No is chosen} \end{cases}$$

We present the probability of a respondent choosing a YES alternative if the household is willing to pay for the initial bid. Also, a respondent will choose a NO alternative if the household is not willing to

pay for the initial bid. Thus, a YES alternative is only chosen if a respondent's WTP value is greater than the initial bid offered. On the other hand, a NO alternative is only chosen if a respondent's WTP value is less than the initial bid offered. The choice of the respondent's WTP depends on some socio-economic variables. This is specified as:

$$\Pr(yes[y_i]) = \Pr(WTP(M_i, \mathbf{X}_i, \varepsilon) \geq I_i \quad (6)$$

$$\Pr(no[y_i]) = \Pr(WTP(M_i, \mathbf{X}_i, \varepsilon) < I_i$$

where y_i is WTP responses which describe the probability of choosing either a yes or a no by the household, M_i is the income of household i, $\mathbf{X_i}$ is the vector of socio-economic variables and other contextual characteristics or controls that influence WTP for household i, I_i is the initial bid offered to household i, and ε is the random error term which is assumed to be normally distributed with mean zero and a constant variance. Empirically, we simplify our regression equation as:

$$\mathrm{y}_i = \mathbf{X}'\boldsymbol{\beta} + \varepsilon \quad (8)$$

and the log-likelihood as:

$$LogL = \sum_{i=1}^{n} \left[y_i \ln\left(\Phi\left(\beta_0 + \beta_1 \mathbf{X}_i\right)\right) + (1-y_i) \ln\left(1-\Phi\left(\beta_0 + \beta_1 \mathbf{X}_i\right)\right)\right] \quad (9)$$

We acknowledge that parameters in discrete choice models rarely reflect the marginal impact of the variable in question. Thus, the index of coefficients of probit models is different from the marginal effects. The latter in its general form is presented as:

$$\frac{\partial E(y_i, |x_i)}{\partial x_i} = \left\{ \frac{dF\left[\beta' x_i\right]}{d\left(\beta' x_i\right)} \right\} \beta_i \quad (10)$$

By extension, our estimated model is expressly stated as:

$$y = \alpha + \beta_1 \mathrm{Trust} + \beta_2 \mathrm{lnBid} + \beta_3 \mathrm{G} + \beta_4 \mathrm{HH} + \beta_5 \mathrm{MS} + \beta_6 \mathrm{lnY} + \beta_7 \mathrm{C_{dum}} + \varepsilon \quad (11)$$

In model 11, *Trust* is a dummy variable measuring trust in the government, the log of the initial bid, *lnBid* is the log of the starting point bids, *G* is a dummy variable representing the gender of the respondent, *HH* is the household size of respondent, *MS* is a dummy variable representing the marital status of respondent, *lnY* is the log of respondent's monthly income after tax, and *C_dum* is the community-specific dummies (Table 1).

Results and Discussion

Results

The Ghana Living Standards Survey which measures the living conditions and well-being of the population quoted the average income in the Greater Accra Region in 2008 at GHS 544. This figure shows a limited disparity with the average income of GHS 420.46 reported in our study. Considering that the GHS 420.46 reported in the study is the lower bound estimate for the respondents, the disparity becomes lesser. Given that the per capita income of Ghana increases by 5.7% over the period 2008 to 2015 from $1266.1 to $1340.4, the increase in average income in the region from 2008 to 2016 does not deviate considerably from what has been reported in the GLSS. From the last Population & Housing Census as reported by the GSS [27], the average household size is 3.7 which is not too different from the 3.0 reported in this study. In line with the census as well as a feature of most African countries, we find that 65% were male household heads showing that male-dominated headship is common in the study area. The respondents who were not married (52%) at the time of the survey were more than those who were married (48%). This marital status distribution reflects the case of the region as reported by the census where about 64 and 36% are unmarried and married, respectively.

Table 1 Descriptive statistics

Variables	Definition	Description	[a]Obs.	Mean	Std. dev	Min.	Max.
WTP (Trust)	Willingness-to-pay for a 24-h supply of electricity amounts reported by the respondents who trust in the government	Amount in Ghana cedis (GHS)	190	66.78	42.41	10	300
WTP (No Trust)	Willingness-to-pay for a 24-h supply of electricity amounts reported by the respondents who have no trust in the government	Amount in Ghana cedis (GHS)	323	69.76	36.92	10	250
Trust in Gov't	Trust in the government	Trust = 1, Otherwise = 0	513	0.37	0.02	0	1
Bid	Starting point amount	Amount in Ghana cedis (GHS)	514	55.06	28.74	10	100
Gender (male)	Gender of respondent	Male = 1, Female = 0	514	0.65	0.47	0	1
Household Size	Household size of respondent	Number of people in household	514	3.00	3.00	0	16
MS_dum	Marital status of respondent	Married = 1, Unmarried = 0	511	0.48	0.50	0	1
Income	Monthly income of respondent	Amount in Ghana cedis (GHS)	508	420.46	301.46	100	1300

[a]Varying sample sizes reported indicate missing responses from the survey

Table 2 shows the six estimated models with trust in the government as the variable of interest. As earlier mentioned, trust is used in this study as a proxy for social capital. As posited in theory, we expect the social capital to vary positively with WTP. Polyzou et al. [28] indicate that higher 'stocks' of social capital is expected to vary positively with the quality of public goods. Also, "when a citizen's trust factor is close to 0, his stated WTP will be lower than the desired WTP to financially support an announced project" ([4], p.1). Inconsistent with theory, we find the coefficient of trust to be negative and statistically significant in all our estimated models (with and without control variables) for improved electricity supply in Ghana. From all the probit models, we argue that those who trust the government have the probability of willingness to pay less for electricity. Since the coefficients of probit models do not necessarily represent marginal effects, we interpret our results using the marginal effect (see model 7). We observe that the marginal effect is −0.05, implying that if trust in the government rises from zero to one, the probability of WTP will fall by 5%. One reason that explains this result is the fact that electricity in Ghana is regarded as a government-owned and government-controlled service which in addition, is highly subsidized. So, those who trust in the government's ability to provide do not see the need to pay more for the service. This can further be explained by the consumer free-riding behavior effect as a result of government benevolence or trust in government promises. That is, if the government promises to provide the service and the people believe in the promise, then based on trust, they would be unwilling to bear any significant additional cost for its use. Hence, our results.

The coefficient for *lnbid* is found to be negative and highly significant in all estimated models. From model 7, we find that a 1% increase in the *lnbid* has the probability to decrease WTP by about 10%. Stated differently, the associated marginal effect is −0.10, showing that, if bid rises by 1%, the probability of WTP will fall by 10%. Showing an inverse relationship between the *lnbid* and the WTP responses for electricity as expected. This is as expected because it is a theoretical requirement.

Gender is also found to be positive and highly significant. That is, males have a higher probability of paying more for electricity relative to females. Indeed, being a male relative to female is associated with a 13% rise in the probability of willingness to pay for improved electricity supply.

Household size is observed to be marginally significant in model 4. This implies that larger household sizes have a higher probability of paying for electricity. However, contradictory results are found in the other models, albeit not significant.

Table 2 WTP for electricity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	WTP	WTP	WTP	WTP	WTP	WTP	Marginal effects
Trust in Gov't	−0.29*	−0.33**	−0.38**	−0.34**	−0.37**	−0.38**	−0.05**
	(0.149)	(0.150)	(0.162)	(0.162)	(0.181)	(0.192)	(0.024)
Bid (ln)		−0.61***	−0.74***	−0.71***	−0.79***	−0.82***	−0.10***
		(0.209)	(0.231)	(0.225)	(0.230)	(0.234)	(0.029)
Gender(Male)			1.08***	1.08***	1.05***	1.03***	0.13***
			(0.165)	(0.166)	(0.189)	(0.197)	(0.019)
Household Size				0.05*	−0.02	−0.02	−0.002
				(0.029)	(0.030)	(0.033)	(0.004)
MS_dum					1.54***	1.31***	0.16***
					(0.300)	(0.316)	(0.03)
Monthly_Income (ln)						0.89***	0.11***
						(0.171)	(0.018)
Constant	0.96***	3.64***	3.68***	3.42***	3.54***	−1.19	
	(0.148)	(0.916)	(1.013)	(0.999)	(1.028)	(1.307)	
Community Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.07	0.09	0.21	0.22	0.35	0.44	
Wald chi(6-11)	24.68***	30.58***	64.09***	68.18***	69.08***	97.42***	510
Log- pseudo likelihood	−183.97	−179.87	−156.02	−154.50	−128.68	−111.08	
Observations	513	513	513	513	510	510	

Dependent variables: willingness-to-pay (WTP) responses for electricity
Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Marital status was introduced in the model to evaluate the effect of marital status on WTP. We find the coefficient to be positive and highly significant. This indicates that married respondents have a very high probability of paying more for electricity relative to single respondents. Specifically, married respondents have a 16% probability of willingness to pay more for improved electricity relative to single respondents.

In addition, we find income to be positive and highly significant in the models. With a marginal effect of 0.11, we have evidence to show that, if income rises by 1%, the probability of respondents willing to pay more for improved electricity supply will rise by 11%. This explains that higher income respondents are willing to pay more for electricity relative to lower income respondents. This provides evidence which satisfies a theoretically valid CV study.

Discussion

Our key results indicate that those who trust the government are willing to pay less for improved electricity supply where as those who do not trust the government, and perhaps believe the private sector could do better, have demonstrated that they are willing to pay more for an improved service. One reason which justifies this relationship is if politicians (or the government) are able to influence the people into believing in its ability to provide the service without burdening beneficiaries fully. Another reason in literature that supports this finding is the presence and role of the private sector. In line with Wiser [15], if households see the private sector as more efficient relative to the public sector, then they would not mind trading off much to the private sector in order to increase their well-being.

In absolute terms, those who trust the government are willing to pay GHS 66.78 a month for improved electricity supply. This amount constitutes 15.9% of the stated household income. On the other hand, those who do not trust the government are willing to pay GHS 69.76, representing 16.6% of the stated household income for a monthly use of electricity. In our study, we controlled for the starting point bias by randomizing the starting point amounts because of the elicitation mechanism used. That notwithstanding, we still have evidence that our WTP estimate is downward biased. This conclusion is reached following Navrud and Ready [29]. They have acknowledged that if the estimated WTP value is greater than the starting point bid, then it means that there is evidence of downward bias. Alternatively, if the estimated WTP values are less than the starting point amount, it means that there is evidence of upward bias. We argue that the bias could have been larger if we had not controlled for it. Studies such as Langford et al. [30] and Navrud and Ready [29] have shown that there is no entirely satisfactory solution to such bias especially after controlling for it.

In Ghana, electricity services to a large extent have mainly been owned, controlled and supplied by the government. The role of government is demonstrated through three key institutions namely Volta River Authority (VRA; Generation), Ghana Grid Company Limited (GRIDCO; Transmission) and Electricity Company of Ghana (ECG; Distribution). Data available indicates that electricity generation in Ghana has mainly been hydro. Until, the 1998/1999 season when the nation went through severe blackouts, thermal and other sources of generating electricity was almost nil in the energy generation mix of the country. Thus, from the period of independence up until 1998/1999, a hydro generation had been the main source of electricity generation. This, as compared to other sources of power generation, is a cheaper source of power and therefore makes the end user pay less for power as compared to the cost of electricity generated from alternative sources.

The introduction of thermal energy as a means of alternative power generation meant that the end user cost of the commodity has had to rise over the years. Ghanaian consumers have had to gradually see increases in the amount they pay for a kilowatt of power as compared to previously. This has been a source of great discomfort for consumers. The cost of electricity has therefore been an important index in the cost of doing business or the cost of keeping homes. It has also become a key factor in determining the popularity or otherwise of a government.

Governments over the years have therefore sought to take advantage of the situation to popularize themselves and continue their stay in power by giving assurances of a lower cost of electricity especially for the purpose of perpetuating their stay. This has led to the institution of subsidies on the commodity over the years, bringing some comfort to the end user but creating generation and distribution problems for the generator and the main distributor.

In the eyes of the consuming public, the continuous involvement of the government in the generation, transmission and distribution of the product is an assurance that electricity services will be provided at lower prices per kilowatt hour. The public's trust in the government especially in the delivery of the service is an assurance of the availability of the product at lower prices and indeed that they are willing to pay less. Thus, trust in the government comes with a lower willingness to pay for services owned and controlled by the government. This perhaps may be different from privately produced goods. Government attitude as far as the commodity is concerned had given sections of the public the confidence that the supply of the commodity is a social

responsibility which the government owed to the consumer, and thus, they want to pay less. This result contradicts Haile and Slangen [5] who found evidence of a positive and significant coefficient for the trust-WTP relationship.

Some sections of the consuming public on the other hand do not trust the government as far as the supply and distribution of the service are concerned and are therefore willing to pay more for the improved electricity. Over the years, the government's policies in the power sector have failed to yield desired results. This has led to severe load shedding exercises at various stages of the nation's history. The nation has experienced such load shedding exercises in the latter part of the 1990s and the most recent and most enduring one being that which was experienced between 2012 and 2016. One common thing about all these load shedding exercises has been the increasing involvement of Independent Power Producers (IPPs) into the sector. That is, there is an increasing involvement of the private sector in the provision of electricity in Ghana. It has also meant the continuous use of thermal sources as against hydroenergy. Many of the solutions that the government has put in place to deal with the shortages in the supply of the product have been costlier than the previous hydrogeneration. This has gradually raised the end-user tariff for a kilowatt hour of electricity. The government has also had to gradually remove subsidies on the product as a means of dealing with generation problems and fiscal challenges. The section of the public that have come to accept this trend do not trust that the government can continuously supply the electricity services at lower rates. They are believed to be in the know that electricity cost can only rise if supply is to be reliable. Hence, the lack of trust in the government makes them prepared to pay more for the product. For them, the continuous increases in utility tariffs over the period, coupled with the increasing number of IPPs, is sufficient evidence that the government cannot be trusted to supply electricity at the same rates as before. Thus, those who do not trust the government are willing to pay more for the product. To continue to enjoy uninterrupted power supply, they must reduce their reliance on the government to provide the commodity.

Conclusions

Our study focused on a household's WTP for improved electricity supply in the GAR of Ghana. We hypothesized that trust as a proxy for social capital plays a key role in determining the WTP. A standard CVM questionnaire was designed and administered through a face-to-face interview process. That is, a survey data was collected by a team composed and trained by the researchers. We have evidence to support the assertion that trust is important in determining WTP. However, the trust-WTP direction may depend on the good or service in question as well as its ownership and control. Thus, if the commodity in question is owned and controlled by a socially concerned government, with the belief that services will be provided without necessarily burdening consumers, then one will expect an inverse Trust-WTP relationship. In this study, we find that there is a statistically significant negative relationship between trust and WTP for improved electricity supply in Ghana. Those who trust in the government expressed a lower willingness to pay relative to those who do not trust the government.

In addition, we find that households who trust and do not trust the government are willing to pay GHS 66.78 and GHS 69.76 for improved electricity supply, respectively. These amounts constituted approximately 15–17% of the households' income. This is consistent with existing studies. We therefore recommend that policymakers should commence educating citizens on the unsustainability of the government's provision given her limited budget. Politicians must desist from inducing citizens to blindly repose trust in them as it has an effect on their WTP. If the government now wants to provide a 24-h electricity service (and be fully paid for by consumers), it needs to make sure that its politicians are more responsible in the promises they make on behalf of the government and, in particular, that they do not promise that the government can provide a better electricity service at no extra cost to the people. This should mean that people who do not trust the government at the moment might start to do so. And everyone will know in advance that there will be additional money to pay for an improved electricity service and they will be willing to pay the government for it.

Overall, this paper sheds light on the trust-WTP relationship for improved electricity in Ghana. We suggest that significant evidence still needs to be generated on this relationship considering the various dimensions of trust as well as the role of trust in specific institutions in the power sector on WTP.

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Authors' contributions

All sections of the study including concepts, designs, fieldwork, write-up and initial proofreading were jointly done by the authors. The names of the authors have therefore been presented in an alphabetical order. All authors read and approved the final version of the manuscript.

Competing interests

The authors declare that they have no competing interests.

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