

What does better mean? Perceptions of Electricity and Water Services in Santo Domingo

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Abstract¹

Santo Domingo faces one of the poorest electricity and water services among Latin American cities, a situation which has prevailed for decades despite the significant welfare losses associated with such infrastructure deficiencies. In this context, how do households define these services? What areas of improvement would mean the most to them? This paper takes a consumer's centric-approach to address these questions, identifying specific dimensions of quality and reliability by which households perceptually define what better means. Further, preliminary evidence suggests that, regardless the prices of the services, end-users' satisfaction and disposition to pay would significantly increase with quality improvements.

Keywords: electricity attributes, water attributes, price fairness, electricity quality, water reliability.

JEL codes: D12; Q25; Q40

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1. Introduction

Low quality electricity and water services are the status quo in the emerging world and mainly affect the poorest families, constraining their potential for development and translating into significant welfare losses in the society. At the same time, the associated low levels of consumer satisfaction with these services may erode perceptions of the public sector, causing generalized distrust of governmental policies, particularly in cases where services are provided by state-owned utilities or in markets facing market reforms.

In finding ways to achieve sustainable improvements of those services; a growing literature emphasizes the need for a deeper knowledge of end-user preferences. Understanding end-users' needs and priorities substantially contributes to the design of better regulations, as well as, informing financing and investment decisions with higher private and social returns (Gunatilake, Patail, and Yang 2012; Franceys and Gerlach 2011; Abdullah and Mariel 2010; Lin 2005; Holt 2005; Akram and Olmstead 2011). A fundamental pre-condition for understanding consumer behavior is properly defining the object of choice, which in this context includes identifying the attributes that define electricity and water services in terms of consumer preferences. This approach provides demand-driven information on the areas where regulations and investments would be most meaningful to consumers; therefore, it represents a key input for policy decisions aimed to improve public services. In contrast, ambiguous or incomplete definitions of those attributes could lead to imprecise or biased conclusions which may translate into inefficient allocations of resources (Hensher et al. 2005).

In this context, with the aim of contributing to a better understanding of end-users' preferences, this note focuses on identifying the main attributes by which end-users define electricity and water services. Under this main target, this document constitutes a field exploration on the demand side perceptions related with electricity and water services, from which we report preliminary results about users' disposition and willingness to pay for improvements in these services. The case study takes place in Santo Domingo, Dominican Republic, a country that despite having doubled its per capita income over the last two decades and reached high electricity and water coverage, still has some of the lowest quality and least reliable service in the developing world.

The framework of this paper corresponds to the literature on stated preference valuation, which can be broadly divided into contingent and discrete choice analysis. Under both methodologies, precisely identifying attributes of the service constitutes an essential step in effectively measuring consumer preferences (Hensher et al. 2005; Hoyos 2010). In the literature, this step is mainly based on small focus groups and expert opinions, methods which may lead to identification problems such as correlated responses and biased perception, among others. In this framework, one contribution of this paper is to comprehensively identify public service attributes based on semi-structured in-depth interviews, a method that overcomes the aforementioned limitations (see for example Creswell, 2009; Harrell & Bradley, 2009; Neuman, 2003). Further, we complement this qualitative approach with the application of close-question questionnaires, allowing us to get a better picture of the socioeconomic characteristics of our respondents, as well as, of the public services they receive. To the best of our knowledge, this paper is the first in providing a detailed discussion on the identification of attributes of electricity and water services.

In providing an insight into end-users' perceptions our findings also stimulate policy and behavioral questions related to price fairness perception and quality. Indeed, while preliminary, our results suggest that price fairness perception increases with better quality of public services, a relationship which require further study given its implications for price acceptance and consumers' satisfaction.

The next section presents some background about the case study. Section 3 presents details about the approach and data collection, while section 4 documents the main results for electricity and water services. Section 5 discusses our findings and concludes.

2. The case study – Santo Domingo

The case study focuses on Santo Domingo, a city that comprises 40% of the country's urban households². Despite having reached complete access to electricity and over 91% of water coverage³, it has some of the lowest quality and least reliable services among Latin American and Caribbean (LAC) cities (see S.I.1 for additional information on the comparative performance of Dominican Republic). In 2010, firms reported that service is interrupted an average of around 23 times per month for electricity and around 2 times per month for water; that is approximately 10 times and 3 times the average levels registered across the region, respectively⁴. The situation is even more severe in the residential sector, where for example 50% of clients face daily blackouts lasting between 3 and 8 hours at a time (MEPyD 2014).

Electricity and water distribution services are provided by state-owned utilities, in a difficult business environment characterized by poor physical infrastructure, high non-payment rates and elevated water and electricity theft, which over the years left systematic operational losses and consequently low investment capacity⁵. Despite this context, those utilities have made efforts to improve both services, particularly in electricity where, over the last years, infrastructure investments have slowly increased the number of customers receiving uninterrupted service. Between 2013 and mid-2015, the share of the customers which received upgraded services increased in 5%⁶. Along this process, it has been clear the need for better understanding of end-users' preferences as a basic pillar for designing solutions that have into account their capacity and disposition to pay (IADB 2014).

In effect, the persistence over decades of these unpaid poor public services has not clear consequences on end-users' preferences and perceptions, raising important policy questions with

² We will refer to Santo Domingo which includes the provinces of Santo Domingo and Distrito Nacional, the households share are calculated according to the last Population Census of 2010.

³ Own estimation based on the National Survey of Labor Force (NSLF) of 2014.

⁴ Own estimations for Santo Domingo based on the World Bank Enterprise Survey (WBES, 2010), see supplementary information.

⁵ i.e. over the last years (2012-2014) both sectors presented significant operational deficits as reported by “Corporación Dominicana de Empresa Eléctricas Estatales” (CDEEE) and the “Instituto nacional de Aguas potables y Alcantarillados” (INAPA).

⁶ Own calculations for the provinces of Santo Domingo and Distrito Nacional, based on the Balance of Circuits – July, CDEEE, 2015.

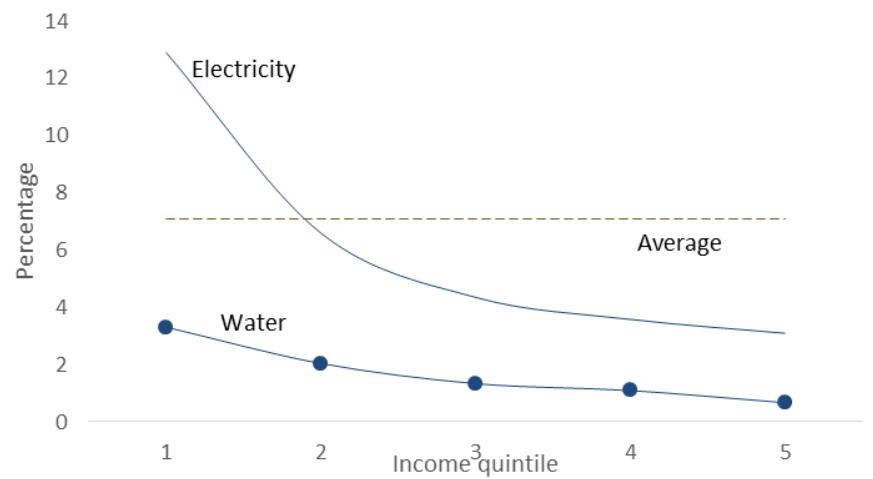
regard to end-users disposition and willingness to pay for improvements. That is, do consumers prefer free low quality services or do they prefer to pay for services' upgrades.

In particular, the affordability dimension has been a central concern at policy level as electricity and water expenditures comprise a significant share of households' budgets, limiting their financial capacity to pay higher rates, or even pay for the services. Indeed, as a share of household disposable income, expenditure in both services ranges from 7% in the average household to 16% in the poorest quintile. Most of this expenditure concentrates on electricity that represents up to 12% of total households' income, having a significant higher weight across all income groups.

Figure 1

Expenditures in electricity and water represent between 4% and 16% of household income

(Electricity and water expenditures as shares of household income in Dominican Republic, 2007)



Authors' elaboration based on the National Household Expenditure Survey of Dominican Republic in 2007.

Note: The figure only accounts for payments to the utilities. Figure is calculated only for households with reported positive expenditures in both services.

Notwithstanding, a growing literature suggests that in developing countries, households have a clear preference for better services, for which they are willing to pay for. For example, in the cases of India and Kenya, number of blackouts and blackout length are among the most valuable attributes for end-users (Abdullah & Mariel 2010; Gunatilake et al. 2012). Similarly, Akram and Olmstead (2011) find evidence that households in Pakistan would be willing to pay substantial amounts for safe drinking water. However, valuation studies in developing countries are still

scarce regardless is in such cases where financing of public services is more complicated and challenging. Further, previous studies focus in valuation, while less attention is put into characterizing end-users' perception of public service. This note contributes to fill this gap by providing an insight into end-users' perceptions in a developing country experiencing severe deficiencies in the provision of public services (see SI.1 for a comparison between Dominican Republic and Latin American and non-Latin American countries).

3. Approach and data

Identifying the attributes of electricity and water services that are most relevant to end-users implies providing the respondents freedom to explain in their own terms how they define those services. To this end, we use semi-structured in-depth interviews, avoiding the limitations of other methods typically used in the literature, such as focus groups, expert opinions and secondary sources. Focus groups have three inter-related drawbacks: (i) they are subject to group dynamics, potentially leading to correlated responses; (ii) members in those groups may not share the same preferences which would complicate any ordinal exercise of attributes; and (iii) the results may not be generalizable beyond the groups conducted. On the other hand, expert opinions may be subject to partial or biased individual perceptions and tends to have low representativeness for large populations. Finally, information from secondary sources usually lacks validity when extrapolated to different contexts.

In our case, there is great variation in the quality of services which may affect the perceptions of an already heterogeneous population. At the same time, previous studies identifying attributes of interest in developing countries are still scarce, precluding us from generalizing to our case study. Our approach overcomes those drawbacks by performing face-to-face interviews and using a representative sample of end-users. The main limitation of in-depth interviews is the potential for interviewer bias, which we minimized by selecting households in each area through a systematic random sampling procedure and by using 10 different interviewers.

The in-depth interviews were complemented with the application of close-question questionnaires, allowing gathering additional comparable information from the target respondents. The construction of the questionnaire and interview guide was based on pilot

interviews, interviews with experts and secondary sources (Akram & Olmstead, 2011; Carlsson & Martinsson, 2007, 2008; Hatton MacDonald, Morrison, & Barnes, 2010; Hensher, Shore, & Train, 2005, 2006, 2014; Nalder & Morrison, 2004). The questionnaires contain around 35 questions each, including both structured and open questions⁷.

The target respondent was the household member responsible for decisions related to water and electricity services (paying or contracting). The interviews took place during the month of April 2015, performing a total of 120 interviews, 60 about electricity and 60 about water⁸, all with different respondents across 30 urban areas. The areas were selected on the basis of consultation with experts and field visits in order to capture the maximum variability in terms of electricity and water services. The selection includes areas classified as poor, middle income and higher middle income according with the index of unsatisfied basic index (NBI, for its acronym in Spanish)⁹. It is important to emphasize that sample sizes were estimated in order to obtain aggregate representative responses; however, no clusters or strata were accounted for, therefore mean comparisons across sub-groups do not have statistical power or confidence. Nonetheless we add some supporting statistical information showing that our results are consistent even when we break the sample into sub-groups (see S.I.2).

To capture respondents' perceptions, the interviewer posed general structured questions, including ones about the frequency and length of service interruptions. Then, in an open question, respondents were asked to expand upon their general experience and to express opinions about the current service. After that, a key task for gaining insight into end-users' priorities was requiring them to identify, describe and rank each characteristic she/he had previously mentioned. To translate those rankings into scores, the responses were re-scaled to the maximum number of attributes mentioned by any respondent, and then averaged by attribute in order to account for the number of answers¹⁰. The results are summarized in figures 2 and 4.

⁷ This material is in Spanish, available upon request.

⁸ The sample size was selected based on simple random sample, taking as a reference the household population of Santo Domingo, variance in per capita household income and the average electricity and water interruptions (source: NSLF-2014 and WBES-2010). The bounded error was assumed to be ¼ of the standard deviation of each variable.

⁹ The NBI index was calculated by the SIUBEN (*Sistema Único de Beneficiarios*) based on the poverty-census implemented in 2011.

¹⁰ We applied the following standardization: $score_A = \frac{\sum_i(max - rank_i^A)}{N}$, where *max* stands for the maximum number of attributes mentioned for any respondent; $rank_i^A$ refers to the placement (first, second, etc.) respondent *i* allocated to attribute A.

Besides the main target of identifying relevant attributes, the questionnaires include direct open-ended questions about end-users' willingness to pay any extra amount (above their average monthly expenditure) for better services. While there are better methods for these estimations, this approach satisfied our case study's objective to preliminarily explore disposition and willingness to pay (WTP). In general, it is not possible to distinguish the valuation of each attribute with this approach, and end-users may not have incentives to reveal their true WTP or translate their statements into real payment behavior. However, Carson & Groves (2007) argued that honest answers are more common when two conditions are met: first, respondents believe that their answers have some probability of affecting outcomes; second, the question refers to public goods, where people know that they must honor the contract. These conditions are met here, particularly with regard to electricity, where end-users are aware that there have been gradual improvements in service, and that those improvements have been associated with greater enforcement in charging for services.

4. Disentangling perceptions of electricity and water services

Electricity

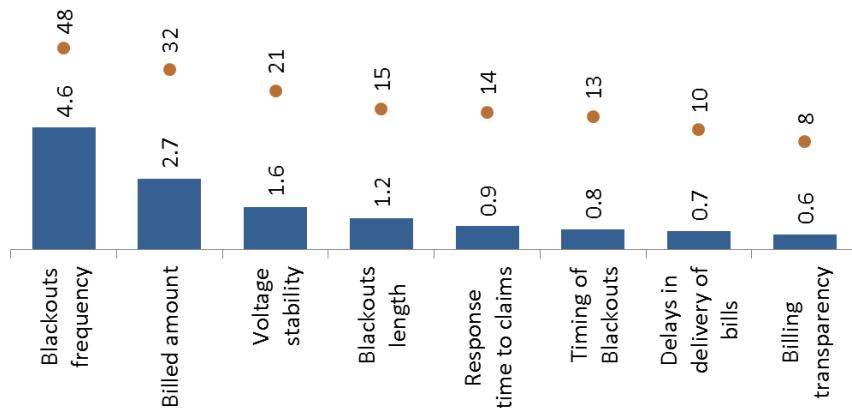
Most end-users were able to disentangle their perception of electricity services into specific attributes. On average, each interviewee mentioned and ranked between 3 and 5 attributes, from which a total of 8 were identified and listed in figure 2. The two most relevant attributes were the frequency of blackouts and the amount households were billed, with 48 and 32 responses, respectively. This is not surprising given the severe deficiencies in the electricity sector and the relatively high electricity prices. In fact, with the exception of voltage stability, those responses are well aligned with previous studies at the household level (Hensher et al. 2014; Abdullah & Mariel 2010).

On the other hand, while unstable current is more commonly reported in studies that focus on firms, our respondents did emphasize its adverse effects on the longevity of appliances and lightbulbs. Current instability severely reduces incentives to acquire more efficient appliances which tend to be more sensible to brownouts. In fact, the most common scenario in poorest urban

areas – current instability and severe unavailability of electricity service–, implies not practical use of refrigerators or any productive equipment.

Figure 2

The most important electricity attributes



Authors' elaboration based on 60 interviews.

Note: Blue bar=Score; Orange circle=Number of answers.

To provide context to the ordering stated by the respondents, Table 1 presents general characteristics of the electricity services they receive. The average household in our sample experiences 1.8 outages per day of an average duration of 3.8 hours, leading to associated expenditures of US\$4.6 per month, mainly for the purchase of candles and gas. There is also a low payment ratio (80%) and an even lower metering ratio (60%), indicating that a significant share of users do not pay for the service. This is in part a result of poor electricity infrastructure which precludes the utility from imposing greater monitoring.

An important pattern during the interviews was that respondents who expressed dissatisfaction with the billed amount also tended to express dissatisfaction with billing transparency and delays in bill delivery. Most respondents relate transparency with the difficulty to understand how the total charges are calculated, and/or how consumption is metered. This points to commercial deficiencies of supplier, which seem to translate into distrust of the utility.

Table 1**Descriptive statistics of electricity service**

Indicator	Stats
• % with Metering	60
• Number of interruptions per day	1.8
• Average length of interruptions (hours)	3.8
• % with subsidy (Bonoluz)	20
• % who consider the price fair	37
• Quality, from 0 (worst) to 10 (best)	4.5
• % of households that pay for the services	80
> Av. amount spent, monthly (US\$)	24.6
• % Declared disposition to pay	50
> Declared monthly WTP (US\$)	8.2
• Monthly expend. due to interruptions (US\$)	4.6

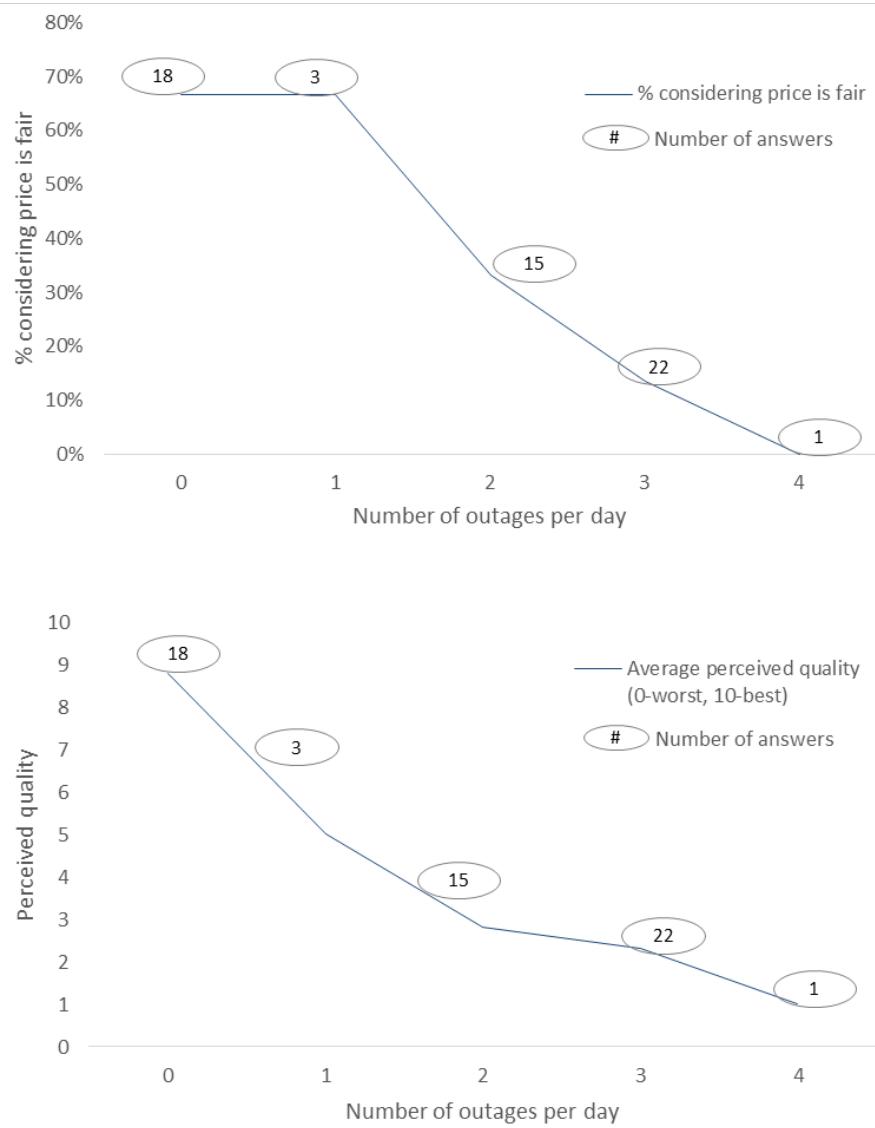
Authors' elaboration based on 60 interviews.

However, and despite the billed amount being a key driver of consumer satisfaction, these results suggest that people's perception heavily depends on the quality of the service they receive. Using the number of outages per week as an indicator of service quality, figure 3 plots, in the first row, the percentage of respondents considering fair the amount paid for the service. The association is clear. The percentage of respondents stating that the amount paid is fair reduces with lower quality of services. Similarly, using a scale from 1 (worst) to 10 (best) to rank the end-users' perception of quality of services, the second row of figure 3 shows that quality perception increases as the number of outages reduces, independently of the amounts paid for the service. These patterns suggest that, *ceteris paribus* the price, quality of services is key for consumer's satisfaction.¹¹

¹¹ The supplementary information reported in SI.3 suggests that such correlations maintain to the presence of some control variables such as education –as proxy of income– and being beneficiary of subsidy.

Figure 3

Quality and perception of electricity service



Authors' elaboration based on 59 responses for price fairness and 60 interviews for perceived quality.

As an aside, in the particular case of electricity, consumers who had recently received service improvements found it difficult to disentangle attributes of their electricity service. They described the service as “good”, but were unable to specify any particular characteristic of it. In contrast, clients who had been exposed to services’ upgrades for a longer period were able to

identify attributes that could be improved. Those attributes related mainly to commercial dimensions of the service, such as billing transparency, delays in bill delivery, and notification about unexpected blackouts. This suggests that users adapt to new service characteristics, demanding more elaborated attributes once their basic requirements have been satisfied. This is in line with a growing literature showing that subjective measures of well-being tend to adapt over time (Diener et al.; Di Tella et al. 2010) and may have relevant implications in terms of consumer satisfaction with public services. On the other hand, it is also in line with case studies in developed countries where despite high levels of quality and reliability, clients still identify areas of improvement for which they would be willing to pay.

With regard to the disposition to pay (DTP), around 50% of users would pay more if service were to improve. These users consist mainly of households in low-income areas with the worst quality services. In contrast, the DTP of respondents with uninterrupted service is significantly lower. Among those who declared a positive disposition to pay, the average additional amount is about US\$8, approximately 1/3 of the actual average bill, and twice the average reported expenditures due to interruptions.

Water

In the case of water service, all respondents were able to distinguish, on average, 3 attributes, with availability of the service mentioned most often. As before, this is not surprising since discontinuity of water service is even worse than for electricity service, translating into lower perceptions of quality among consumers¹². In effect, our sample indicates that water service is available an average of two times per week, for durations of around 8 hours each time, translating into coping costs of about US\$10 per month. Notice that water scarcity is so severe that end-users refer to this attribute as ‘availability of the service’ rather than ‘frequency of interruptions,’ as it is usually known in the literature.

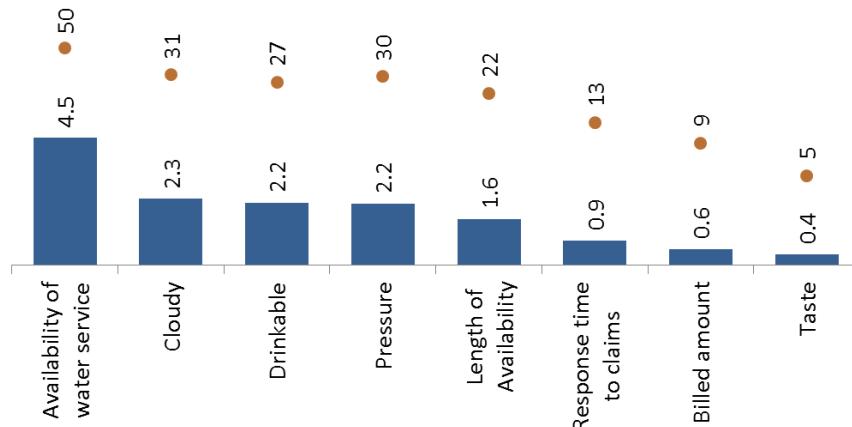
The next most commonly listed attributes—cloudiness and drinkability—seem to be of equal importance for the respondents, to the extent that they usually argued that tap water is not appropriate for human consumption. Further, there is a strong indication that cloudiness, pressure

¹² The perceived quality of electricity services is 4.7, while for water it is 3.7, on a scale from 0 (worst) to 10 (best).

and taste are perceptional correlated as respondents tend to declare those services characteristics together. Accordingly, all interviewed households declared that they buy water for drinking, representing an average expenditure of US\$15 per month.

Figure 4

The most relevant attributes of tap water



Authors' elaboration based on 60 interviews.
Note: Blue bar=Score; Orange circle=Number of answers.

On the other hand, pressure and hours of service are described as relevant because improvements in those characteristics would increase a given household's capacity to store water. Here there is an interaction with availability of electricity, as users mainly depend on electric water pumps to achieve the necessary pressure to store enough water. Therefore, longer hours of both services allow a greater chance of storing 'enough' water to last until the next time it is available, typically three to four days.

Table 2**Descriptive statistics of water service**

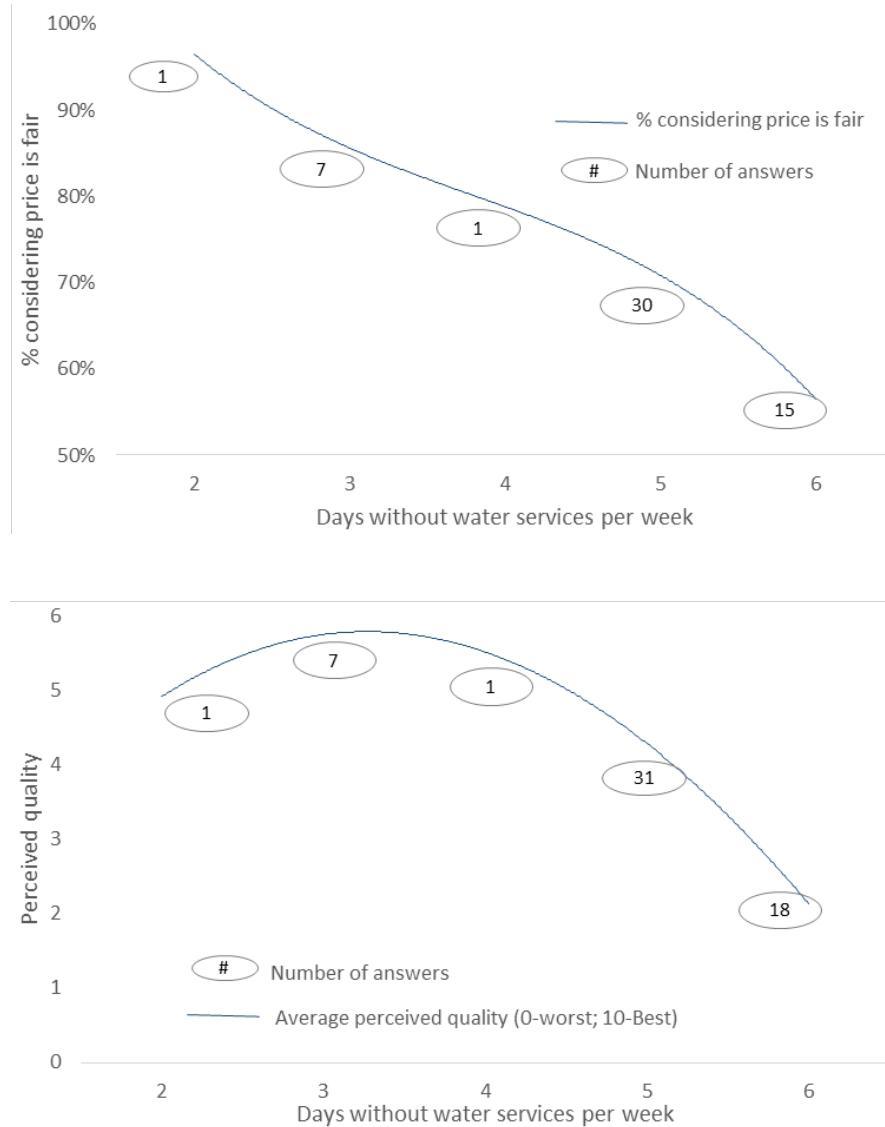
Indicator	Stats
• % with Metering	48
• Number of days with water service per week	2.1
• Average length of water service each time it is available (hours)	7.8
• % who consider the price fair	60
• Quality, from 0 (worst) to 10 (best)	3.7
• % Paying for water service	70
> Av. amount spent, monthly (US\$)	5.9
• Monthly expend. due to interruptions (no drink)	10.1
• % Household purchase of drinking water	100
> Monthly expenditure in drinking water (US\$)	15
• % hh declaring DTP (no drink)	70
> Declared WTP, monthly (US\$)	3.5
• % hh declaring DTP (drinking water)	80
> Declared WTP, monthly (US\$)	5.9

Authors' elaboration based on 60 interviews.

The interviews also confirm the low ratio of payment (70%) which, as in the case of electricity, is related with poor monitoring capacity of the utility as for example only 48% of the respondents have meter. In contrast to electricity, 60% of respondents consider the price of tap water to be fair, which we mainly interpret as a result of the low water prices in the country and its associated minor weight in the household budget. Nonetheless, the remaining respondents (40%) find the price to be unfair due to the low quality and the unreliable service –which is approximated as days without water in a week–. That is, the perception of price fairness seems to be linked to quality of the service, even in a context of relatively low prices. This association is also observed for quality perception, reinforcing the intuition that both price acceptance and consumers' satisfaction increase with better service (S.I.3 provides an additional discussion, where some control are introduced).

Figure 5

Quality and perception of water service



Authors' elaboration based on 54 responses for price fairness and 57 responses for perceived quality. Lines are smoothed using degree 3 polynomial.

With regard to respondents' willingness (and disposition) to pay, two questions were posed: the first did not specify particular attributes for improvement, while the second specified that water quality would improve enough to be drinkable. It is worth mentioning that respondents did not know they would be asked a second question about their WTP, so they were not given the opportunity to "adjust" their responses. Around 70–80% of the respondents would pay for better

water attributes. The additional amount they would pay is about US\$3.5 in the first case, increasing to US\$5.9 if water would be drinkable. In contrast to electricity, both DTP and WTP were roughly similar across end-users, reflecting the similarity of water service characteristics across the population.

The average WTP is greater for electricity than for water, even when drinkability is assumed. This is interesting since expenditures for coping with water scarcity are significant, possibly indicating that end-users do not internalize such costs. It may also indicate that consumers' answers to open questions about WTP were based on referenced billed amounts (which are lower than in electricity), incorporating the effect of the relatively low water prices. On the other hand, it is notable that a number of the water interviewees who declared their disposition to pay for improved services also mentioned that they do not believe that improvements could guarantee drinkability. This context is to some degree different from that of electricity, where service improvements have been made in some areas, serving as demonstrative effect for other end-users.

5. Final remarks

This note explores end-users' perceptions of electricity and water services, taking as a case study the city of Santo Domingo. The objective was twofold, first to identify and define the main attributes for end-users, and then to preliminarily test their willingness to pay for improved services. While these targets are primary inputs for the valuation of public services attributes, they also have relevant policy implications in the context under review. That is, given clear infrastructure deficiencies in the provision of water and electricity, along with severe financial constraints of the utilities, it is necessary to identify the most relevant areas for improvement to maximize social welfare. Further, exploring consumers' disposition and willingness to pay for these improvements adds key information about the feasibility of the required investments.

This examination has identified end-users' perceptual attributes of electricity and water services that match specific regulatory dimensions of quality and reliability. The top five most important attributes of electricity service for consumers are frequency of outages, billed amount, voltage stability, length of blackouts and response time to claims, with around 50% of interviewees declaring their disposition to pay an additional US\$8 monthly for improved services. In the case of water, the most important attributes include frequency of water availability, cloudiness,

drinkability, pressure and length of water availability, with 70–80% of respondents disposed to pay for better services. The declared additional amount they would be willing to pay is around US\$3.5, and could reach US\$5.9 for drinkable tap water. Altogether, this would represent around 1/3 of the actual billing for those services.

A related pattern in the data suggests that both, perception of price fairness and consumers' satisfaction increase as service interruptions reduce –with interruptions serving as an overall indicator of reliability for both electricity and water. That is, despite the Dominican Republic having one of the highest electricity tariffs in LAC, and despite the significant share of household income that water and electricity expenditures make up, end-users seem to “reward” better service. Taking into account that poor services have prevailed for decades, this would be a strong indication that people do not conform to low quality of services, even if they are freely provided.

These results constitute basic research that contributes to the understanding of consumer preferences. Further empirical work, under the Energy Division research agenda, includes expanding the sample size in order to provide detailed analysis by subgroup (i.e. income groups, location, etc.), as well as applying more sophisticated valuation methods to elicit WTP. These results also stimulate research on the linkages between consumers' perception, prices and quality of services, which are key elements to account for end-users' responses to market reforms.

References:

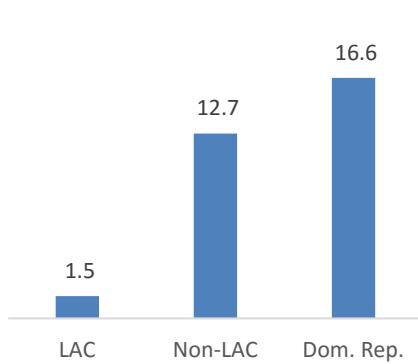
- Abdullah, S. & Mariel, P., 2010. Choice experiment study on the willingness to pay to improve electricity services. *Energy Policy*, 38, pp.4570–4581.
- Akram, A.A. & Olmstead, S.M., 2011. The Value of Household Water Service Quality in Lahore, Pakistan. *Environmental and Resource Economics*, 49(2), pp.173–198.
- Carlsson, F. & Martinsson, P., 2008. Does it matter when a power outage occurs? - A choice experiment study on the willingness to pay to avoid power outages. *Energy Economics*, 30, pp.1232–1245.
- Carlsson, F. & Martinsson, P., 2007. Willingness to pay among Swedish households to avoid power outages: A random parameter Tobit model approach. *Energy Journal*, 28, pp.75–89.
- Carson, R. & Groves, T., 2007. Incentive and informational properties of preference questions. *Environmental and Resource Economics*, 37, pp.181–210.
- Creswell, J.W., 2009. *Research design: Qualitative, quantitative, and mixed methods approaches*.
- Diener, E., Lucas, R.E. & Scollon, C.N., Beyond the hedonic treadmill: revising the adaptation theory of well-being. *The American psychologist*, 61(4), pp.305–14.
- Franceys, R.W. a. & Gerlach, E., 2011. Consumer involvement in water services regulation. *Utilities Policy*, 19(2), pp.61–70.
- Gunatilake, H., Patail, S. & Yang, J.C., 2012. *Valuing Electricity Service Attributes : A Choice Experiment Study in Madhya Pradesh , India*,
- Harrell, M.C. & Bradley, M. a., 2009. *Data Collection Methods: Semi-Structured Interviews and Focus Groups*, RAND.
- Hatton MacDonald, D., Morrison, M.D. & Barnes, M.B., 2010. Willingness to Pay and Willingness to Accept Compensation for Changes in Urban Water Customer Service Standards. *Water Resources Management*, 24, pp.3145–3158.
- Hensher, D.A., Rose, J. & Greene, W.H., 2005. *Applied choice analysis: a primer*, Cambridge University Press.
- Hensher, D.A., Shore, N. & Train, K., 2005. Households' willingness to pay for water service attributes. *Environmental and Resource Economics*, 32, pp.509–531.
- Hensher, D.A., Shore, N. & Train, K., 2006. Water supply security and willingness to pay to avoid drought restrictions. *Economic Record*, 82, pp.56–66.
- Hensher, D.A., Shore, N. & Train, K., 2014. Willingness to pay for residential electricity supply quality and reliability. *Applied Energy*, 115, pp.280–292.

- Holt, L., 2005. Utility service quality—Telecommunications, electricity, water. *Utilities Policy*, 13(3), pp.189–200.
- Hoyos, D., 2010. The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*, 69, pp.1595–1603.
- IADB, 2014. Support for the power distribution network modernization and loss reduction program - Dominican Republic. August.
- Lin, C., 2005. Service quality and prospects for benchmarking: Evidence from the Peru water sector. *Utilities Policy*, 13(3), pp.230–239.
- MEPyD, 2014. Plan Nacional - Plan Plurianual del Sector Publico 2013-2016.
- Nalder, C. & Morrison, M., 2004. Valuing Improvements to the Quality of Electricity Supply Using Choice Modelling. *Energy*, pp.1–17.
- Neuman, W.L., 2003. *Social Research Methods: Qualitative and Quantitative Approaches*.
- Di Tella, R., Haisken-De New, J. & MacCulloch, R., 2010. Happiness adaptation to income and to status in an individual panel. *Journal of Economic Behavior & Organization*, 76(3), pp.834–852.

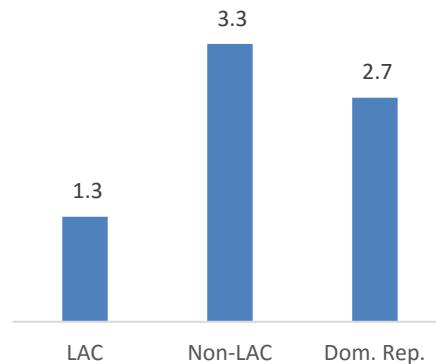
Supplementary Information (SI)

SI.1. Reliability of water and electricity services as reported by firms

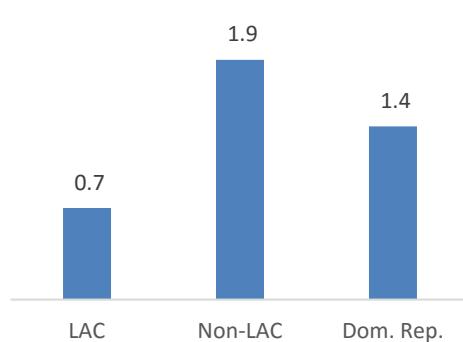
Number of outages per month



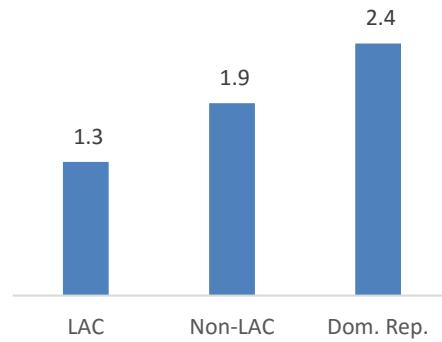
Duration of power outages (hours)



Number of water shortages per month



Duration of water shortages (hours)



Own estimations based on World Bank Enterprise Survey, all years, all countries with available information.
Note: LAC—Latin American and the Caribbean countries.

SI.2. Extended summary statistics from the interviews

Although our case study does not allow statistical confidence in examining sub-groups, we could distinguish type of clients in electricity and water services. In the case of electricity, it is identified three broad types of users/services; informal users (no meter, no contract), clients with contracts but also interruptions, and clients with service 24/7 (with contract and usually with meter). In the case of water, three types of clients were identified: informal users, users with contracts but without meters, and users with contracts and metering.

A. Electricity	Type of User			All
	Informal User	Clients with Interruptions	24/7 Clients	
• Number of Respondents	8	34	18	60
• Share with Metering	0.0	0.6	0.9	0.6
• Number of interruptions per day	2.6	2.5	0.0	1.8
• Average length of interruptions (hours)	5.1	4.7	1.4	3.8
• Hh reporting time of occurrence of the blackout	1.0	1.0	0.2	0.8
• Share with Bonoluz (subsidy)	0.0	0.2	0.1	0.2
• Share who consider the price is fair	0.0	0.3	0.7	0.4
• Quality , from 0(worst) to 10(best)	3.9	2.4	8.8	4.5
• Share of household that Pay for the services	0.0	0.9	1.0	0.8
> Av. amount spent	.	18.8	34.2	24.6
• Share Declared disposition to pay	0.8	0.6	0.1	0.5
> Declared WTP (US\$)	8.9	8.0	6.8	8.2
• Monthly expend. due to interruptions (US\$)	5.1	5.7	1.2	4.6
• Holding of "inversor"	0.25	0.59	0.11	0.4

B. Water	Type of User			Total
	Informal User	with contract, w/o meter	with contract and meter	
• Number of Respondents	16	15	29	60
• Share with Metering	0	0	1	0.48
• Number of times with service per week	2.1	1.9	2.1	2.1
• Number of times with service per week	10.7	7.5	6.3	7.8
• Share who consider the price is fair	0.3	0.6	0.7	0.6
• Quality, from 0(worst) to 10(best)	3.4	3.3	4.1	3.7
• Share Paying for water service	0	0.9	0.9	0.7
> Amount paid	.	6.2	5.7	5.9
• Monthly expend. due to interruptions (no drink)	9	6.4	12.5	10.1
• Share Household purchase of drinking water	1	1	1	1
> Monthly expend. in drinking water (US\$)	11.6	17	15.9	15
• Share hh declaring DTP (no drink)	0.8	0.7	0.8	0.7
> Declared WTP (US\$)	3.8	3.1	3.5	3.5
• Share hh declaring DTP (drinking water)	0.7	0.7	0.9	0.8
> Declared WTP (US\$)	6.9	4.7	5.8	5.9

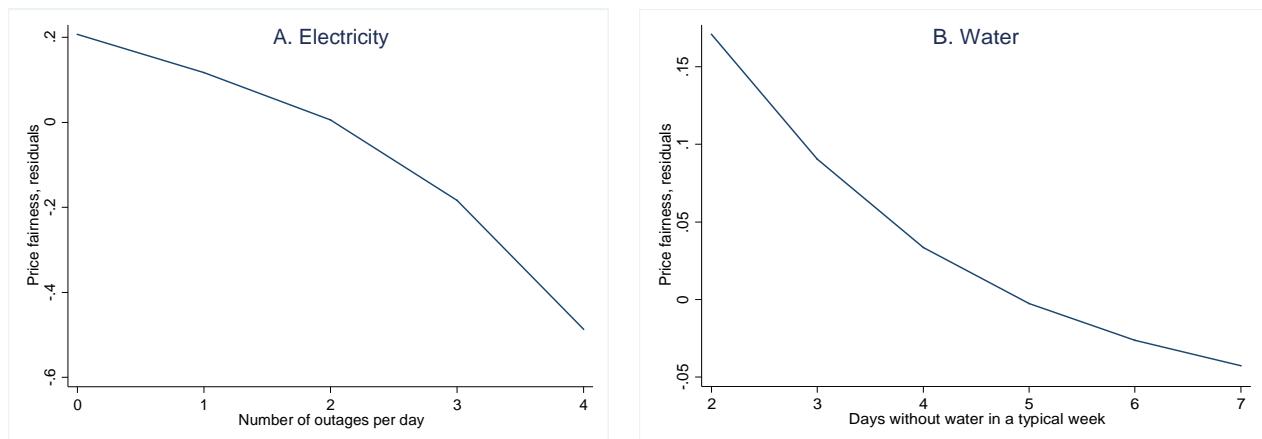
Source: 60 in-depth household interviews in electricity and 60 in water.

Note: WTP is calculated for those which declared disposition to pay.

SI.3 Price fairness perception and service interruptions, with controls

Notice that in figures 3 and 5 in the paper we may have, at least, two potential confounders, monitoring and income. Monitoring tends to increase with the quality of services, thus higher payment rates may be due to increased enforcement (from greater monitoring) rather than greater satisfaction with improved services. On the other hand, income and quality of service may be positively correlated, as wealthy households are able to live in areas with better service or may have other means of access to water (such as storage) that bias the perception of tap water.

We tried to clean the relationship between ‘better’ services and price fairness perception by first regressing (by OLS) the last variable on some available control variables –an indicator if the household pay for the services, self-declared economic condition, education and if the household receive subsidy. Subsidy only applies to electricity. Then residuals are estimated and regressed against the number of interruptions (as a proxy of quality of services). We highlight that the same shapes shown in figures 3 and 5 are obtained after accounting for the available controls. Still, the small sample size and potentially measurement error call for more detailed examination.



Own estimations based on data from interviews.