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# **Measuring demand for sanitation in developing countries: A new theoretical and methodological framework for contingent valuation surveys**

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*Working paper*

## ***Abstract***

A review shows that contingent valuation (CV) studies implemented in developing countries are generally used to measure demands (for water, sanitation or health services) and neglect the valuation of nonmarket goods (like ecosystems, biodiversity, or environmental amenities). These studies also make few references to the standard theoretical framework, because that framework, which reflects the much debated source of welfare economics, is useless for surveys that focus on people's demand. Yet paradoxically, it continues to influence survey design and data interpretation. This article therefore aims to complete, theoretically, the construction of an autonomous research program to establish demand measurement guidelines in developing countries and show, through a survey implemented in Moshi (Tanzania) about demand for sanitation, some methodological changes that would result from a new theoretical perspective built on recent results from behavioral economics and economic psychology.

## **Introduction**

Since being implemented first in 1980 in Bangkok (Grandstaff and Dixon, 1986) the contingent valuation method (CVM) has been widely used in developing countries. A review shows that such surveys mainly have focused on goods or services such as water, sanitation, or health but neglected topics traditionally investigated by CVM in industrialized countries, including ecosystems, biodiversity, or environmental amenities.<sup>1</sup> This difference in the type of goods and issues across countries might reflect the varying objectives for the use of CVM. As conceived of in industrialized countries, it aims to provide information to support cost–benefit analyses, particularly those that require a valuation of nonmarket goods (e.g., environmental topics). From this perspective, CVM informs decision makers about the legitimacy of their public policies. But in developing countries, CVM has been mainly developed to provide an indicator of projects' feasibility; for example, 69% of the surveys contained in the review intended to measure demand for water, sanitation, or health services. For authors of such work, the objective of CVM surveys is to answer questions, such as, "*How many people would connect to the water network if the price of the connection was  $x$ ?*".

This research agenda in developing countries was largely initiated by Dale Whittington, who conducted in Haiti, in 1986, the first contingent valuation survey in the context of water for a developing country (Whittington et al., 1990), then co-directed the World Bank Water Demand Research Team, which implemented between 1987 and 1990 several subsequent surveys in Brazil, Zimbabwe, Nigeria, Pakistan, and India. This “research program was grounded on the recognition that policy and planning should be built on a better understanding of what improvements in their water services the people want and are willing to pay for” (World Bank Water Demand Research Team, 1993, p. 48). Contingent valuation provided a tool to assess people's willingness to pay for new water services. Such water-oriented research, followed by research implemented by the Water and Sanitation Programme in the 1990s,<sup>2</sup> helped establish a new scientific corpus related to CVM but built on different objectives and peculiar to the economic context and public policies of developing countries. The studies realized through this perspective generally make few references to the standard theoretical framework, because that framework, which reflects the much debated source of welfare economics, is useless for surveys that focus on people's demand. Yet paradoxically, it continues to influence survey design and data interpretation.

This article therefore aims to complete, theoretically, the construction of an autonomous research program to establish demand measurement guidelines in developing countries and show, through a survey implemented in Moshi (Tanzania) about demand for sanitation, some methodological changes that would result from the proposed new theoretical perspective. Therefore, the next section outlines the standard theoretical foundations of CVM, followed by some new theoretical perspectives built on recent results from behavioral economics and economic psychology. We present the survey conducted in Moshi and discuss the methodological choices of giving respondents “time to think” and the use of bidding games.

### ***Flawed foundations of the standard CVM framework***

Most CVM surveys attempt to measure welfare variation stemming from a change in people’s environment or health (e.g., air pollution), the value of nonmarket goods (e.g., endangered species), or demand for new goods or services (e.g., water services). These notions are equivalent in the standard theoretical framework: A person’s willingness to pay (WTP) for new sanitation equipment or services provides a measure of welfare variation through better environment and health, or the value she assigns to the equipment or service or a point (price, quantity) on her personal demand curve (Milanesi, 2007, p. 162). The research agenda is homogeneous across different uses, because standard theory holds that the monetary value of any goods exists, like a platonic idea, and can be measured. Economists are therefore “archaeologists whose task are to uncover values presumed to exist” (Gregory and Slovic, 1997, p. 177), and the only difficulty associated with this task is determining the method of extraction. Therefore, researchers work to build methods that can measure, as precisely as possible, the “real” value of goods, with minimal biases, which in turn take a central place in the scientific debate (Mitchell and Carson, 1989; Venkatachalam, 2004).

Yet recent research challenges this theoretical framework. Critics came from philosophy, sociology, and economic theory indicating that people can not substitute any value in monetary terms (Milanesi, 2007) and therefore contradicting the axiom of comparability of standard consumer theory. According to the utilitarian (Benthamian) foundations of this axiom the value of any good, including money, reflects the utility it gives the consumer: any good and money can be compared in utility terms, any good can therefore be expressed in money (Hodgson, 1997) and the market space is universal, with no limits on monetary valuation. Philosophers like Sagoff (2004) and O’Neill (1997) however argue that people also act on deontological grounds, out of respect to moral principles that can eliminate the

possibilities of comparability and monetary valuation. This perspective has been used by economists to highlight situations of incommensurability (Aldred, 2006) or lexicographic preferences (Spash, 2000). Furthermore, recent work on monetary economics (Aglietta and Orléan, 2002) has established that the use of money is socially defined and limited, which raises doubts about the hypothesis of universality of the market space (Milanesi, 2007). If the use of money in exchanges is socially bounded, such that monetary value is socially constructed and not a natural or preexisting characteristic of goods, then the monetary valuation of nonmarket goods must be impossible - or at least not socially neutral.

Other challenges to the standard theoretical framework of CVM come from economic psychology and behavioral economics (Payne et al., 1992; Gregory et al., 1993), which “shows that preferences for unfamiliar choices do not exist full blown in people's minds, but are constructed during the decision process” (Gregory and Slovic, 1997, p. 176). Experimental evidence has established that this constructive process is context dependant (Tversky and Thaler, 1990). These results radically contradict the standard hypothesis of the stability of consumer preferences and the consubstantial idea of the existence of a “real” value that can be revealed (Payne et al., 1999). If “real” value does not exist, it makes no sense to intend to measure it and CVM, which “does not measure what it intends to measure,” would need to be abandoned (Plott, 1993).

### ***New perspectives***

This radical abandonment conclusion might be mitigated through consideration of the different tasks assigned to CVM. Payne et al. (1999) differentiate data collected to design or guide public decisions and those used to predict sales of a product. We suggest new research perspectives are possible by addressing these two uses.

The first, design-based category, involves monetary valuations of nonmarket goods which provides information about the legitimacy of new public policies. The objective of these valuations is to measure people's preferences or values to select the best policy among several alternatives. This preference measurement might involve a constructive perspective, such that the “truth may ultimately reside in the process of the evaluation, rather than in the outcome” (Gregory and Slovic, 1997, p. 177). Accordingly, the economist is no longer an archaeologist who tries to reveal or discover a reality hidden to ordinary people but rather an architect who participates to the construction of the reality (Payne et al., 1999). All values may be expressed

in monetary terms, but authors such as Gregory and Slovic (1997) also incorporate the idea of incommensurability into their arguments.

These authors thus address the future of CVM, but another research question emerges pertaining to analyses of data collected through prior studies: If surveys did not reveal “real” values, what did they measure? The critical interpretation is that CVM, as a summary of value or welfare variation, is an expression of the misunderstanding between the researchers and the people interviewed (Milanesi, 2009). Researchers understand “welfare variation,” “use value,” “total value,” or “benefits,” whereas respondents express, through a particular payment vehicle,<sup>3</sup> their demand for a common or a new good or service. According to the standard framework, this payment vehicle should be “as plausible as possible” (Mitchell and Carson, 1989, p. 3) but not influence people’s answers—goals that seem not only paradoxical but also contradictory with the results of behavioral economics. Context and the payment vehicle are central in people’s decision and need to take a central position in interpretations of CVM answers. New research on this issue might help clarify the meaning of the data collected in past CVM surveys; from an experimental perspective, it also would support investigations of the way people combine moral commitments with monetary payments.

Behavioral economics findings also might influence research on the contingent measurement (i.e., prediction) of demand for new goods or services, the second type of CVM use. These surveys provide information about the feasibility of policies or projects by measuring the WTP of households for new goods or services (e.g., water supply, sewage connections). The objective is to predict, as precisely as possible, the demand that people would express in a real purchasing context. This exercise involves goods or services that people usually pay for, which creates no incommensurability problem.<sup>4</sup> The standard theoretical framework then is a useless burden for this kind of survey, because the assumptions required for welfare valuation are not necessary for studying consumer demand (Blaug, 1986) and lead to false methodological instructions that focus principally on biases. These behavioral economic outcomes suggest that the objective should not be to reveal the “real” value of the goods, without biases, but rather to measure demand influenced by the survey, just as real demand would be influenced by a real purchasing context. From this perspective, the context of the survey (including the questionnaire) is not a potential source of bias but rather an element that necessarily alters the construction of people's preferences. The research agenda therefore should focus on building survey instruments that match the real purchasing context as closely

as possible (Payne et al., 1999). We consider the methodological consequences of this perspective on a survey measuring demand for sanitation in the Tanzanian city of Moshi.

### ***Moshi survey***<sup>5</sup>

Located at the foot of the Mount Kilimanjaro, in northwest Tanzania, Moshi is the administrative capital and economic center of the Kilimanjaro region. According to the national census, its population was 144,336 in 2002.

After preliminary investigations including focus group discussions, repeated interviews with key local stakeholders (e.g., Moshi Municipality, MUWSA), and surveys of craftsmen working in the on-plot sanitation sector and the microfinance market, a willingness-to-pay (WTP) survey pertaining to new sanitation facilities was implemented in 2002 in this town.

The WTP was measured for six solutions:

- Improvement of normal latrines to ventilated improved pit (VIP) latrines (WTP1),
- Building of VIP latrines (WTP2),
- Building of a soil pit (WTP3),
- Building of a soil pit and VIP latrines (WTP4),
- Building of a soil pit and septic tank (complete on-plot equipment, WTP5), or
- Connection to the sewer (WTP6).

The research objectives and characteristics of the local context led to the implementation of two different surveys: one for households and another for landlords.<sup>6</sup> The household survey included tenants and owners, which resulted in 609 households selected through a three-stage random sampling procedure. The WTP of tenants was expressed in terms of a rent increase, whereas owners were asked to give their WTP for a new investment. The focus group discussion revealed clearly that questioning tenants about investments was not credible. A survey question confirmed that more than 80% of tenants think investments in the plot is landlords' responsibility (Milanesi 2007). This methodological choice was important for the global reliability of the operational outcomes of the survey, because according to municipal sources and as confirmed by the survey sample, 50% of the population rents housing in Moshi.

To complete the investigations on rent increases and dynamics of investments in renting plots, we also interviewed 97 landlords who own 129 plots on which 703 households live. These landlords were interviewed with regard to their willingness to invest in sanitation facilities in their renting plots and increase rents after this investment (Milanesi, 2007; Milanesi et al., 2003).

Other methodological experiments were also implemented during the survey; we asked the households about their willingness to work, investigated landlords' and owners' WTP on credit, tested the influence of having time to think on households' WTP, and used bidding games as an elicitation method. We focus here on the last two experiments.

## **Giving time to think**

In a real situation, people should construct their preferences; therefore, we assume that this process can take some time, particularly for important purchases such as sanitation facilities in developing countries. To respect this procedural aspect, we chose to give respondents in Moshi time to think. This granting of time to think consists of dividing the interviews into two days. In Moshi, for the members of sample interviewed with this procedure, the first day was dedicated to different questions pertaining to respondents, their household, and their settlement; then on the second day, the interviews focused on WTP questions. At the end of the first day, the interviewer gave the respondent information about the good valued and asked him or her to think about the household's WTP for this good, to be reported the next day. The respondent was free to consult anyone to make this decision before responding to the WTP questions.

### **Time to think decreases WTP.**

Few studies include giving time to think to respondents, likely because of the extra costs resulting from this procedure. Three surveys conducted by Dale Whittington involved water or sanitation issues in Nigeria, Ghana, and the Philippines. The results of the influence of time to think on households' WTP were clear in the water survey in Nigeria: "giving people time to think consistently *reduced* their bids" (Whittington et al., 1992b, p. 217). The conclusions are similar for the sanitation survey in the Philippines (Lauria et al., 1999) but less clear in Ghana, where time to think influenced only one facility (Whittington et al., 1992a).<sup>7</sup>

The tests realized in Moshi confirm these conclusions.<sup>8</sup> According to results on 12 WTP questions (6 sanitation solutions for tenants and 6 for owners), WTP answers provided after time to think are inferior for 10 questions, as Table 1 shows. Not all these difference are significant according to Wilcoxon-Mann-Whitney tests, but this result may be due to the small size of the sample per questions<sup>9</sup> The negative influence of time to think on WTP bids



is confirmed by the analysis of WTP determinants with a partial least squares (PLS) regression .

	Time to Think	n	Mean	Standard Deviation	Mann-Whitney Tests		PLS Coef.
					Z	p	
<b>Tenants</b>							
Latrines improvement (WTP1)	Yes	42	795	520	-0.88	0.38	-0.18
	No	71	949	762			
VIP latrines (WTP2)	Yes	48	1213	824	-0.74	0.46	-0.09
	No	79	1157	898			
Soil pit (WTP3)	Yes	48	1205	828	-0.77	0.44	-0.07
	No	84	1346	1285			
Latrines + soil pit (WTP4)	Yes	47	2041	1459	-0.08	0.93	-0.09
	No	72	2581	3915			
Complete equipment (WTP5)	Yes	48	1409	899	-0.88	0.38	-0.01
	No	88	1511	998			
Connection to sewer (WTP6)	Yes	81	1552	1605	-0.34	0.74	-0.11
	No	166	1856	4141			
<b>Owners</b>							
Latrine improvement (WTP1)	Yes	44	16 341	16585	0.00	0.03	-0.07
	No	76	21243	13154			
VIP latrines (WTP2)	Yes	42	109286	11866	-1.76	0.08	-0.1
	No	69	143913	116618			
Soil pit (WTP3)	Yes	35	181171	289321	-0.34	0.73	0.03
	No	76	173066	213964			
Latrines + soil pit (WTP4)	Yes	34	158235	988826	-1.57	0.12	-0.1
	No	70	200743	128519			
Complete equipment (WTP5)	Yes	21	198333	186650	-0.91	0.36	-0.03
	No	55	225691	159156			
Connection to sewer (WTP6)	Yes	76	176059	116005	-0.36	0.72	-0.04
	No	160	196844	147624			

*Table 1: WTP bids (Mean and Standard Deviation) with and without time to think ( Tanzanian Shillings) Wilcoxon-Mann-Whitney tests and PLS coefficients.*

### Collective decision

These results are difficult to explain with a standard theoretical framework: If a “real” value exists, that value should be revealed in the survey and should not change over time. In other words, these observed WTP changes violate the assumption of preference stability. Some authors have tried to explain these changes according to the effect of time and information on decisions. Whittington et al. (1992b) used a model from Hoehn and Randall (1987) that integrates these factors on the estimation of a Hicksian consumer surplus. In this framework,

time and information decreases uncertainty and, considering that people are risk averse, “CVM estimates of WTP should not decrease with increased time or information to decide on a bid” (Whittington et al., 1992b, p. 207), which is opposite the observations from the preceding surveys.

Changes in WTP across time are not a problem if we consider that preferences are constructive and context dependant (Tversky and Thaler, 1990). From this perspective, the decrease in WTP can be explained by the discussion people had during the day with their family or fellow tenants. This change even might be considered an indicator of the reliability of the information collected. Some questions asked during the Moshi survey allow further developments on this issue. In particular, when people had a day to think about WTP questions, the interviewers asked them first if they had used the day to consult with other people; 83.3% of owners and 88.4% of tenants responded positively to this question. They did not however consult the same people (see Table 2).

Talked with:	<i>Other Members of the Plot</i>	<i>Family (wife &amp; husband included)</i>	<i>Friends/Neighbors</i>	<i>Nobody</i>
Owners (n = 66)	4.50%	77.30%	10.60%	16.70%
Tenants (n = 69)	50.70%	44.90%	8.70%	11.60%

*Table 2: How people used their time to think<sup>10</sup>*

The details in Table 2 show that 77.3% of owners talked with their family. This figure confirms the results from focus group discussions that investment in sanitation is a household decision. The price of new VIP latrines, at the time of the survey, represented at least 10 months of expenditures (excepting rent) for half of the households interviewed,<sup>11</sup> and as noticed by Whittington et al. (1992b, p. 206) in Nigeria, the respondents acted as if it were a real situation and “need[ed] the opportunity to consult with other family members before reaching a decision that [was] binding for the household unit.”

Discussions inside the household may decrease WTP because other needs and budget constraints, neglected when the answer is immediate, can come to the fore when the other members of the household are consulted, as in normal situations. Giving time to think to the owners therefore allows them to recreate the decision-making process inside the household, and the decrease of WTP can be interpreted as an indicator of reliability.

Tenants who consulted someone also consulted their family but at a lower rate (44.9%), meaning that rent increases are not decisions as closely related to the household unit as

investments are. The rent increase seems to be a plot decision more than an household decision: 50.7% of tenants talked with other members of their plot. Further analysis even shows that when tenants talk about the rent increase they often reach a collective agreement. Specifically, after each WTP answer, the tenant respondents considered the following question: “Do you think that the other tenants living in your plot would accept to pay the same rent increase to get this facility?” The results are in Table 3.

	Time to Think	n	Other Tenants Accept Paying the Same Rent Increase?		
			Yes	No	Don't know
WTP1	No	70	40.0%	45.7%	14.3%
	Yes + discussion with other members of the plot	17	82.4%	17.7%	0.0%
WTP2	No	75	40.0%	45.3%	14.7%
	Yes + discussion with other members of the plot	19	84.2%	15.8%	0.0%
WTP3	No	82	39.0%	47.6%	13.4%
	Yes + discussion with other members of the plot	19	84.2%	15.8%	0.0%
WTP4	No	69	30.4%	43.5%	26.1%
	Yes + discussion with other members of the plot	19	84.2%	15.8%	0.0%
WTP5	No	85	28.2%	49.4%	22.4%
	Yes + discussion with other members of the plot	18	88.9%	11.1%	0.0%
WTP6	No	152	44.1%	38.2%	17.8%
	Yes + discussion with other members of the plot	30	83.3%	16.7%	0.00%

Table 3: Time to think and agreement on rent increase between tenants

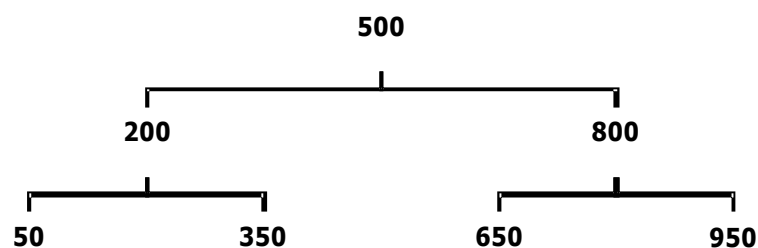
Without time to think, 38.2%–45.7% of people believed that the other tenants in their plot would not accept the rent increase. From 13.4% to 26.1% of the same subsample did not know what their decision would be. However, the situation changed dramatically when people had time to think and used it to talk with other tenants; they then gained knowledge about others’ decision. Therefore, the proportion of “yes” answers increases to more than 80% for all the WTP questions. When people discussed the decision with their neighbors, they agreed on the rent increase they would be willing to pay. This result is not surprising considering the focus group discussions that indicate a plot is not only a living area but also a social and economic unit. People cooperate in the plot (for children care for instance), use facilities in common (like sanitation, water tap or shower), share collective tasks (cleaning the commons) and often organize economic activities like informal insurance or savings (called “*upatu*” in swahili). This unit seems to be the relevant one for decisions about rent increase, especially when these decisions pertain to shared facilities like sanitation.

The procedure of giving people time to think thus allows respondents to indicate collectively constructed answers, at the family or plot level. People use this period to construct their decision, as they would in a real situation. The decrease of WTP after time to think may indicate data reliability as well, in that it reflects owners' budget constraints. This procedure also offers useful information about the possibility of aggregating demand at the plot level.

### ***Bidding game and starting point bias***

The choice of elicitation method is central to the design of CVM studies, and the advantages and disadvantages of each method have been widely debated (Mitchell and Carson, 1989; Venkatachalam, 2004). Following U.S. National Oceanic and Atmospheric Administration (NOAA) panel recommendations (Arrow et al. 1993), the referendum format (i.e., take-it-or-leave-it approach) has been adopted in many studies in industrialized countries. For example, of the 940 CVM surveys conducted in Europe, North America, Australia, New Zealand, and Japan that are registered in the Environmental Valuation Reference Inventory (EVRI),<sup>12</sup> 455 (48.4%) used a referendum format.<sup>13</sup>

The picture is different in developing countries. A review of 63 surveys between 1986 and 2004 (see footnote 1) shows that the bidding (or bargaining) game format was the most widely used. This method imitates an auction (see Figure 1) and appears in 36.4% of the WTP questions asked in these surveys.<sup>14</sup> This elicitation method mainly serves to measure demand (84.3%).



*Figure 1: Structure of a bidding game used in Moshi survey (willingness to pay a rent increase for latrine improvement)*

### **Why use a bidding game in developing countries?**

In developing countries, the referendum method has some disadvantages. Whittington (1998) provides two reasons to avoid referendum methods in developing countries, related to the poor social acceptance of a procedure that assigns different prices to different subsamples of

the population randomly. First, this approach often leads to demand truncated at the extremities, because researchers “set the highest referendum price to low and the lowest to high” (Whittington, 1998, p. 24). They use to limit the range of prices because in contexts in which the good or services (e.g., water, sanitation, health services) have fundamental impacts on people's lives, overly low or high referendum prices affect the credibility and social acceptability of the survey. Second, for ethical reasons, based on Whittington’s experience, in different surveys people complained because they did not understand “why should one household be charged more than another for a water connection?” (Whittington, 1998, p. 26).

Another argument for abandoning referendum formats cites the benefits of bidding games in such surveys. This method is well adapted to economic contexts in which people are accustomed to bargaining and fixed prices are not common (Dong et al., 2003; Morel à l'huissier, 1998). Specifically, the bidding game is the method that “most closely mimics the normal price taking behaviour in local markets” in developing countries <sup>1</sup> (Onwujekwe and Nwagbo, 2002, p. 2121). Therefore, in line with our research agenda, namely, to build research instruments that match the real purchasing context as closely as possible, we used bidding games in Moshi.

### **Starting point bias?**

Some researchers object to the use of bidding games though because of the alleged existence of a starting point bias.<sup>15</sup> According to Mitchell and Carson (1989, pp. 240-241), a “starting point bias occurs when the respondent's WTP amount is influenced by a value introduced by the scenario,” which they consider common in the bidding game format. But they further assert that “respondents often find it difficult to pick a value out of the air, as it were, without some form of assistance,” such that “the open-ended format tends to produce an unacceptably large number of non-responses or protest zero responses to the WTP questions” (Mitchell and Carson, 1989, p. 97). That is, people may need some kind of assistance or cue to answer, though these elements should not influence on their answer, or rather, they should exert what we could call a “neutral influence”.

The constructive and context-dependant decision model that we adopt avoids this paradoxical injunction for survey design. If there are no “real” preferences, there is no bias and the

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<sup>1</sup>As referendum format match consumers behaviours in industrialized countries (Arrow and alii, 1993) where people are used to “chose or leave” products sold in supermarkets at a given price.

influence of the context on the decision is normal. The influence of price information on people's demand is clear in experimental surveys, as explained by the idea of *response compatibility*. According to Sugden (1999, pp. 167-168), "compatibility is understood in terms of ease of mental processing ; it is hypothesized that individuals tend to use decision making strategies which economize on mental processing." One such strategy consists of using the information available as an anchor and adjust the decision from this point.

The *anchor-and-adjustment* hypothesis has been made by Tversky and Kahneman in 1974, it first reflected the strong influence of randomly defined numbers (i.e., a spin of wheel) when people needed to answer a question about the number of African countries in the United Nations (Camerer et al., 2003). This experimental result has been confirmed by several surveys and extended to WTP surveys on public goods (Ariely and al., 2003). Ariely et al. (2003, p. 78) tested this anchoring effect on ordinary consumer products and concluded that "in situations in which valuations are not constrained by prior precedents, choices will be highly sensitive to normatively irrelevant influences and considerations such as anchoring."

We can draw from these different results that in a real purchasing situation, people may have "some range of acceptable values" (Ariely et al., 2003, p. 77) but not complete preexisting preferences, and their demand is influenced by the price offered by the seller. This price helps contextualize and construct consumer choice. The first bid presented in a CVM survey therefore is not necessarily a potential source of bias but a serious and necessary source of information for the respondent, which should be credible and match as closely as possible the situation in the real world. In other words the goal of survey design is not to attain a hypothetical and oxymoronic "neutral influence" from instruments but to look for the "proper influence," particularly of the first bid (or starting point).

### **Defining starting point**

To fulfill these new standards, the starting point of the bidding game should be realistic, "connected to actual costs" (Griffin et al. 1995, p. 391), credible, and socially acceptable (Whittington, 1998).

To assess the costs and market prices of autonomous sanitation facilities in Moshi, we implemented a survey among 30 craftsmen who build latrines, soil pits, and septic tanks. We also interviewed executives and engineers of the public authority managing the sewer<sup>16</sup> to get information on the price and costs of a connection to the network. Similar to Onwujekwe and

Nwagbo (2002), we gauged the social acceptability of prices in focus group discussions. Some information could also be inferred from a 2000 explanatory survey.

The craftsman survey showed an important dispersion of prices of facilities, certainly due to strategic behaviors (Milanesi, 2007). But even the first-quartile prices of some facilities, or the minimum prices to attain good quality, represented an incredibly large amount for many households. Choosing this amount for the starting point of the bidding game could have led to high levels of refusals. Moreover, for many households, such an investment would not be possible without external financial support (e.g., providing materials). If they had to pay for these facilities, the household's contribution would be lower than market prices. To achieve the objective of credibility, we used starting points lower than the prices suggested in the craftsman survey (see Table 4). In a last stage of the process, institutional actors of the sanitation sector in Moshi validated these prices.

In Tanzanian Shillings, 2002	Mean	Minimum	First Quartile	Median	Maximum	Cost in Materials	Starting Point
Improvement of latrines to VIP	26 322	15000	22 500	24 500	42 000	57%	25 000
Building VIP	622 648	250 000	454 525	560 250	1 416 800	66%	300 000
Building soil pit	530 125	200 200	306 400	440 000	1 758 000	54.7%	200 000
Building of soil pit and septic-tanks	1 579 352	821 000	1 080 600	1 420 000	3 829 800	65.2%	500 000
Connection to the sewer	-	100 000	-	-	500 000	-	300 000

*Table 4: Cost of facilities and starting points of bidding games for owners*

These starting points (Table 4) were provided for the WTP questions asked of owners but not of tenants, who were interviewed in terms of rent increases. The starting point for tenants were defined using the first WTP information collected during the explanatory survey and tested during focus group discussions with tenants and owners (separated or mixed). Two starting points were used for each facility to test the influence of this first bid on answers (see Table 5).

In Tanzanian Shilling (2002)	Low Starting Point	High Starting Point
Improvement of latrines to VIP	500	1000
Building VIP	1000	2000
Building soil pit	1000	1500
Building of soil pit and septic-tanks	1500	2000
Connection to the sewer	1000	1500

*Table 5: Starting points of bidding games for tenants*

### **Starting point influence on WTP**

Dale Whittington and Obinna Onwujekwe have contributed significantly to the development of CVM surveys to measure demand for water, sanitation, or health services in developing countries. They have tackled the influence of starting points on WTP in bidding games in various ways in different surveys. Onwujekwe and Nwagbo (2002) dedicate an entire article to this question, using a survey on demand for mosquito nets in Nigeria, for which they divided the sample in three groups with different starting points. The results of their tests and regression “provide[] no evidence for starting-point bias” (Onwujekwe and Nwagbo, 2002, p. 2127). Their survey also showed a negative influence of the high starting point for one of the type of mosquito net (in contrast with expectations), as well as a high level of zero responses for the high starting point. According to the authors, this unusual result reflected a phenomenon that “also happens in real markets whereby traders who initiate the bargaining exercise by quoting high prices relative to what the buyers think the good is worth are most likely to have more price rejections and less sales” (Onwujekwe and Nwagbo 2002, p. 2128), which confirms the need to set credible first bids.

Whittington et al. (1992a) explored this issue with a survey pertaining to water and sanitation in the city of Kumasi, Ghana. They found a clear influence of the starting point for sanitation service but not water. Another study on the improvement of solid waste management in the Pakistani city of Gujranwala showed no anchoring effects on WTP bids though (Altaf et al., 1996).

Thus, in three surveys, anchoring effects were observed only for WTP for sanitation in Kumasi. These results contrast with evidence collected from CVM surveys in industrialized countries (Mitchell and Carson, 1989), and the difference may be explained by the level of experience that respondents have with the good or service presented. The influence of the information contained in the first bid (or price presented by the seller in real situation) may relate to the experience people have with the considered good or services. In surveys conducted in industrialized countries, dedicated mainly to nonmarket environmental goods, people lack experience with this type of exercise and may be influenced by any provided price information. The anchor influence is therefore strong. However, in surveys in less developed settings, WTP questions relate to well-known goods or services such as mosquito nets, water, or waste disposal, and people already have well-defined preferences that are less likely to be



influenced by new information. In Kumasi, observing an anchor influence on sanitation WTP, Whittington et al. (1992a, p. 56) confirmed “that respondents had a clearer sense of the value of water than of improved sanitation services and were thus less likely to be influenced by the proposed starting point.”

All these results indicate the great need for a credible scenario, particularly in the first bid. If people often exchange the good considered and have clear preferences, they may reject the WTP exercise if the first bids are not credible. If the goods are new or unfamiliar, a reliable prediction is more likely if the first bid matches the context, and therefore the price, of the future provision of that good or service.

In Moshi, the tests of anchoring effects pertained to tenants’ willingness to pay a rent increase if their landlord improved sanitation in the plot. The statistical analysis of their answers in Table 6 shows that the WTP mean is systematically inferior for the low starting point subsample, but this difference is significant for only two of the five facilities. The PLS regression also shows that the low starting point variable has a negative and strong influence on four facilities (for full results, see Milanesi, 2007). We therefore find an anchoring effect in the Moshi survey, at least for two to four of the five facilities. This anchoring effect is coherent with our preceding theoretical claims and analyses of other survey results: Respondents had little experience pricing the “good,” because 75.9% had never paid a rent increase.

		n	Mean	St. Dev.	Mann-Whitney Z	p-Value	PLS Coef. of Low Starting Point
Improvement of latrines to VIP	Low starting point	64	909	1313	-2.175	0.030	-0.30
	High starting point	65	1021	831			
Building VIP	Low starting point	70	1023	649	-1.187	0.240	-0.10
	High starting point	72	1260	970			
Building soil pit	Low starting point	71	1071	637	-1.453	0.146	-0.15
	High starting point	75	1415	1382			
Building of soil pit and septic-tanks	Low starting point	71	1402	822	-0.138	0.892	-0.01
	High starting point	75	1499	1054			
Connection to the sewer	Low starting point	141	1487	1948	-2.666	0.006	-0.13
	High starting point	133	1668	1291			

*Table 6: Influence of starting points on tenants' WTP*

## **Conclusion**

Using a survey regarding WTP for sanitation in a medium-sized Tanzanian town, we have intended to show the profits of abandoning the standard theoretical CVM framework and adopting a new perspective that acknowledges decisions are constructed and context dependant.

As we have shown, the standard framework creates a paradoxical injunction for the analyst: The questionnaire must be credible, informative, and helpful to respondents but at the same time neutral, without influencing people's answers. The influence of the context on respondents' decision is tacitly recognized in all the stages of questionnaire design, but not in the interpretation of WTP bids, which must reveal a "real" and preexisting value. Reality shows that decisions are context dependant, but theory rejects the notion. Ironically, the CVM, born at the crossroads of survey techniques and welfare economics and designed to realize the utilitarian dream of building an arithmetic of pleasure and pain, retains all the limitations of welfare economics. This framework cannot explain several common results from CVM surveys, such as the negative influence of time to think on WTP, the anchoring effect, or the difference between WTP and WTA answers (Sugden 1999). However, if we posit that preferences are constructed and context dependant, the influence of time to think on WTP answers indicates reliability, and the influence of the starting point is an indication of the person's experience with purchasing the considered goods.

Giving people time to think and exploring their behavior during this thinking period also confirms, in Moshi, that preferences and demand are constructed through a decision-making process that includes, in the case of sanitation, family members or tenants living in the same plot. People thus consider their budget constraints and other needs, as well at the goal of reaching an agreement with counterparts.

For the tenants, decisions are collective but may be influenced by the first offer made by the landlord (or first bid in the survey). We need further investigations to determine the relative importance of these two forms of influence and their interactions. However, from our results, we can confirm a lack of "real" or "true" preferences about rent increases for new sanitation facilities. Tenants' WTP range encompasses a set of values that we could have approximated from focus group surveys, which depends on agreements in the plot among tenants and with the landlord. The anchoring effect indicates the possibilities for adaptation/negotiation between the landlord's "supply" of rent increase and tenants' demand. This possibility for agreement is confirmed by data collected during the landlord surveys, though the focus group

discussion also showed that plot agreements were hindered by communication and coordination problems between landlords and tenants (Milanesi, 2007). The dynamics of rental housing are frozen in Moshi; few tenants ever have paid rent increases. This situation illustrates the social construction of markets that do not exist naturally, though they demand common agreements between actors and solid institutional bases (Steiner, 2007). This result also reveals the important theoretical outcomes that can emerge from an approach that mixes behavioral economics with institutional economics or economic sociology.

## Appendix: PLS regression models

<b>Tenants</b>	<b>WTP1</b>	<b>WTP2</b>	<b>WTP3</b>	<b>WTP4</b>	<b>WTP5</b>	<b>WTP6</b>
Number of observations	111	126	131	118	135	246
Percentage of variance of WTP explained by the first three latent vectors	59	54	27	60	42	39
<b>Variables with systematic positive influence</b>	<b>WTP1</b>	<b>WTP2</b>	<b>WTP3</b>	<b>WTP4</b>	<b>WTP5</b>	<b>WTP6</b>
Salaried	0.16	0.15	0.10	0.16	0.15	0.23
Informed on VIP latrines	0.20	0.03	ni	0.11	0.20	0.16
Waste-water / excretas considered as a priority on the plot	0.28	0.27	ni	ni	ni	ni
Who should pay for latrines improvement on the plot : Tenants	0.05	0.11	ni	0.12	0.11	0.08
Typology of relationship between tenants and landlords : Intermediate propinquity	0.13	0.05	0.07	0.08	0.08	0.02
Inconvenience from excretas : Yes	0.18	0.11	ni	0.18	0.13	0.06
Density of the ward : Intermediate	0.13	0.17	ni	ni	ni	ni
Who should pay for improvement of waste water facilities on the plot : Tenants	ni	ni	0.12	0.00	0.02	0.00
Education : Secondary	0.08	0.06	0.04	0.23	0.07	0.09
Action when pit of the latrines is full :Others	0.06	0.05	ni	0.01	0.02	0.13
Gender : Male	-0.01	0.11	0.07	0.23	0.19	0.09
Age	0.04	0.11	0.04	0.00	0.02	0.00
Education: Primary	0.01	0.05	0.03	0.00	0.07	0.01
Satisfaction with existing sanitation facilities for excretas : intermediate	0.07	0.06	ni	0.00	0.00	0.02
Waste-water and excretas problems are the first priority in the ward	0.05	ni	ni	ni	ni	ni
Owning a house on Kilimanjaro slopes	0.12	0.25	0.16	0.16	0.09	-0.03
Water supply : Private tape	0.04	0.17	0.20	0.13	0.00	-0.04
Cooperation on the plot: very good	0.05	0.11	0.09	0.13	-0.06	-0.01
Latrines: "Unroofed flimsy"	ni	0.18	ni	0.15	-0.04	-0.03
Satisfaction with existing sanitation facilities for excretas : not satisfied	-0.03	0.03	nr	0.11	0.14	0.11
Poverty Index 1 (20% richest )	0.00	0.00	0.00	ni	0.00	0.00
Poverty Index 2	-0.04	0.00	-0.08	0.00	0.00	0.21
Poverty Index 3	0.01	0.01	-0.01	0.15	0.10	0.02
Poverty Index 4	0.02	-0.05	0.01	-0.04	0.02	0.05
Poverty Index 5 (20% poorest)	-0.02	0.04	0.02	-0.09	-0.12	-0.15
Action when pit of the latrines is full : Dig another pit	-0.01	-0.04	ni	0.09	0.01	0.08
Number of households living on the plot	0.01	0.08	-0.03	0.10	0.04	0.04

Existing sanitation facilities for excretas : Latrines middle standing	0.04	-0.01	ni	-0.04	0.07	0.02
Number of people listening the interview	0.07	0.03	0.11	-0.09	-0.04	0.01
Tenants living with landlords in the plot	-0.01	-0.01	0.00	0.06	-0.04	-0.07
Education : Higher education	0.00	0.00	0.00	ni	0.00	0.00
Density of the ward : High	0.01	-0.06	ni	ni	ni	ni
Ages of Latrines > 15 years	-0.09	-0.15	ni	0.18	0.05	0.03
Already had information on soil pit	ni	ni	-0.03	0.01	-0.02	0.01
Households living in the plot are relatives	-0.04	-0.02	0.02	-0.03	0.00	0.01
Amount of monthly rent	-0.08	0.05	0.05	-0.03	0.05	-0.07
Unsatisfied with waste water facilities	ni	ni	0.03	0.02	-0.09	0.04
Who should pay for improvement of waste water facilities on the plot : Tenants and landlord	0.03	0.04	ni	-0.03	-0.05	-0.02
Typology of relationship between tenants and landlords : Through job	-0.07	0.00	0.12	-0.05	0.04	-0.03
Who should pay for improvement of waste water facilities on the plot : Landlord	ni	ni	-0.04	0.01	0.02	0.02
Education : Adult education (Middle School)	0.00	0.00	-0.06	0.00	0.00	0.00
Typology of relationship between tenants and landlords : High propinquity	-0.04	-0.02	-0.03	-0.02	0.02	0.02
Head of household	-0.12	-0.01	-0.07	-0.05	0.03	0.04
Action when pit of the latrines is full : Empty the pit	0.03	0.06	ni	-0.03	-0.01	-0.09
<b>Starting point</b>	<b>-0.30</b>	<b>-0.10</b>	<b>-0.15</b>	<b>-</b>	<b>-0.01</b>	<b>-0.13</b>
Existing sanitation facilities for excretas : Latrines low standing	-0.04	-0.07	ni	-0.02	-0.03	0.06
Who should pay for latrines improvement on the plot : Landlord	0.04	-0.07	ni	-0.06	-0.03	-0.07
Existing sanitation facilities for excretas : Latrines high standing	ni	ni	ni	-0.14	-0.06	-0.15
Action when pit of the latrines is full : Shift to the second pit	-0.06	-0.07	ni	-0.23	-0.13	-0.08
Sewer available in the ward	0.06	-0.17	-0.11	-0.10	-0.03	-0.12
Years spent in the plot	-0.09	-0.15	-0.20	-0.20	-0.11	-0.15
Typology of relationship between tenants and landlords : Distant landlord	-0.09	-0.04	-0.12	-0.05	-0.15	-0.04
Who should pay for latrines improvement on the plot : Municipality	ni	ni	-0.11	-0.02	-0.07	-0.04
Number of people living in the plot	-0.06	-0.06	-0.06	-0.06	-0.11	-0.03
Education : None	-0.09	-0.13	-0.08	-0.23	-0.19	-0.13
Satisfaction with existing sanitation facilities for excretas : Very satisfied	-0.09	-0.15	ni	-0.16	-0.19	-0.17
<b>Time to think</b>	<b>-0.18</b>	<b>-0.09</b>	<b>-0.07</b>	<b>-0.09</b>	<b>-0.01</b>	<b>-0.11</b>
Rural Ward	0.07	0.00	ni	ni	ni	ni
Density of the ward : low	-0.16	-0.12	ni	ni	ni	ni
Waste-water / excretas considered as a priority in the ward	ni	-0.01	ni	ni	ni	ni
WC inside the house	ni	0.05	ni	ni	ni	ni
WC in the plot	ni	-0.08	ni	ni	ni	ni

Septic tank in the plot	ni	-0.04	ni	ni	ni	ni
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<b>Owners</b>	WTP1	WTP 2	WTP3	WTP 4	WTP 5	WTP 6
Number of observations	90	85	84	75	53	158
Percentage of variance of WTP explained by the first three latent vectors	34	58	41	72	76	43
<b>Variables</b>	WTP1	WTP 2	WTP3	WTP 4	WTP 5	WTP 6
Saving capacity	0.07	0.14	0.18	0.20	0.05	0.14
Education: Higher education	0.00	0.03	0.05	-	0.14	0.01
Satisfaction with existing sanitation facilities for excretas : not satisfied	0.04	0.21	ni	0.10	0.05	ni
WC inside the house	ni	ni	ni	ni	0.12	0.01
Poverty Index 1 (20% richest )	-	-	-	-	0.22	0.16
Renting rooms	0.04	0.10	-0.03	0.16	0.19	0.29
Latrines in the plot : Middle Standing	0.07	-0.03	0.04	0.07	0.04	0.08
Poverty Index 3	0.12	0.10	0.00	0.08	0.10	0.07
Investment in the house : Pay cash	0.05	0.14	0.14	0.18	0.01	0.09
Education : Secondary	0.10	0.00	-0.05	0.06	0.07	0.04
Density of the ward : High	0.06	0.14	0.14	0.10	0.12	0.01
Investment in the house: Borrow	0.05	0.19	0.11	0.05	0.02	0.03
Waste-water and excretas problems are the first priority in the ward	-0.10	0.02	0.05	0.03	0.13	0.01
Investment in the house : Savings	0.11	-0.05	-0.05	-0.08	0.09	0.05
Number of people listening the interview	0.11	-0.01	-0.01	-0.02	0.03	0.18
Have discussed with : Friends	0.07	-0.02	-0.03	-0.05	-0.07	0.07
Poverty Index 2	-0.08	0.01	-0.04	0.20	0.06	-0.03
Poverty Index 5 (20% poorest)	0.02	0.05	-0.03	0.00	-0.03	-0.01
Gender : Male	-0.03	0.05	-0.10	-0.06	0.03	0.08
Age	0.22	-0.09	-0.01	0.03	0.01	0.02
Waste-water and excretas problems are the first priority in the plot	-0.06	-0.06	-0.05	0.03	-0.04	-0.06
Latrines: High standing	-0.09	0.03	-0.01	-	0.05	-0.07
Latrines: "Unroofed flimsy"	-0.06	0.07	-0.04	0.07	0.04	0.04
Have discussed with : Other members of the plot	0.03	-0.03	-0.03	-0.01	-0.02	0.08
Have discussed with : Husband or Wife	-0.01	-0.09	-0.14	0.07	0.01	-0.01
Unsatisfied with waste water facilities	ni	ni	-0.04	0.06	0.07	-0.04
Ward: Rural	-0.10	0.07	-0.10	-0.11	-0.06	0.00
Education : Middle School	-0.15	0.05	-0.05	0.15	-0.01	0.02
Salaried	-0.07	-0.07	-0.20	-0.07	0.06	0.00
Already had information on VIP latrines	-0.01	-0.17	ni	0.02	ni	ni
Sewer available in the ward	ni	ni	-0.06	-0.06	0.05	-0.04

Tenants living with landlords in the plot	-0.10	-0.03	-0.03	0.06	-0.02	-0.08
Ages of Latrines > 15 years	-0.02	0.00	ni	-0.01	0.03	ni
Density of the ward : Intermediate	-0.02	-0.03	-0.11	0.11	-0.09	0.07
Inconvenience from excretas : Yes	-0.11	0.02	ni	-0.07	0	0.05
Education : None	0.02	0.01	0.03	-0.08	-0.03	-0.08
Water supply : Private tape	-0.02	-0.16	-0.02	-0.19	-0.03	0.01
Head of household	0.06	0.05	-0.22	-0.07	-0.06	-0.10
Number of people living on the plot	-0.04	-0.04	-0.13	-0.12	0.03	0.02
Education : Primary	-0.05	-0.05	0.03	-0.07	-0.07	-0.01
Poverty Index 4	-0.09	-0.14	0.05	-0.18	-0.21	-0.20
Have discussed with : Family	-0.19	-0.01	-0.07	-0.06	-0.09	-0.02
Action when pit of the latrines is full : Empty the pit	-0.02	0.01	-0.03	-0.09	0.04	0.02
Action when pit of the latrines is full : Dig another pit	-0.08	-0.15	0.04	-0.05	-0.21	-0.07
Other households in the plot	-0.14	-0.02	-0.09	-0.07	-0.02	-0.10
<b>Time to think</b>	<b>-0.07</b>	<b>-0.10</b>	<b>0.03</b>	<b>-0.10</b>	<b>-0.03</b>	<b>-0.04</b>
Soil pit in the plot	ni	ni	ni	ni	0.03	-0.08
Action when pit of the latrines is full : Shift to the second pit	0.00	-0.02	-0.09	-0.06	0.00	-0.06
WC in the plot	ni	ni	ni	ni	0.00	-0.10
Septic tank in the plot	ni	ni	ni	-	0.00	-0.08
Already had information on soil pit	ni	ni	-0.19	-0.17	-0.05	ni
Density in the ward: Low	-0.04	-0.10	-0.01	-0.20	-0.01	-0.08
Latrines: Low standing	0.00	-0.06	-0.02	-0.11	-0.10	-0.05
Investment in the house : Impossible	0.11	-0.19	-0.14	-0.09	-0.11	-0.15

Notes: The first tree vectors of the vector analysis were used for each model.

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1 The review consisted of 65 contingent valuation surveys conducted in 30 developing countries in 83 articles published in different academic reviews, gathered from Scindirect and JSTOR Web sites, using the key term “contingent valuation,” as well as searches in a few specific journals, institutional reports (World Bank, WSP, WHO, USAID), and the Internet. The studies were published between the early 1980s and June 2004 (for details, see Milanese, 2007).

2 The WSP is an institution created by the UNDP and the World Bank.

3 Payment vehicles include support from foundations or associations, payment of entrance fees, tax increases, increase of electricity or gas bills, and so on.

4 In some cases, water services can be considered free services. Also, users’ payment for water or sanitation services does not necessarily presume privatization. Policies of complete or partial cost recovery of services through user payments can be implemented by public authorities, as in Moshi (Mhina et al., 2003).

5 This work was part of a research program funded by the French Foreign Office and managed by the NGO PSEAU (Programme Solidarité Eau): "Sustainable management of urban waste and waste water". The complete output can be found at <http://www.gret.org/pseau/>.

6 Hereafter, we use “owners” to refer to people living in a plot they own and “landlords” the people renting rooms or plots to other tenants.

7 Two other surveys include time to think to estimate community participation to tsetse control programs in Ethiopia and Kenya, but these authors did not test its influence on answers (Echessah et al., 1997; Swallow et al., 1997).

8 The sample of 609 households was divided for each WTP question. During the first day, the interviewers invited half of the respondents to make an appointment for the day after, though nearly half of them refused to continue the interview the next day and expressed a will to finish it without time to think. Accordingly, we changed the survey modus operandi: Time to think was offered to every respondent, who could accept it or not. Therefore, 30% of WTP answers were collected from respondents who had time to think.

9 The sanitation facilities submitted for WTP questions to respondents depended on existing facilities on their plot; respondents therefore rarely responded to all WTP questions.

10 People could give different answers (e.g., family and friends).

- 11 According to the data collected in Moshi from craftsmen working on the sanitation sector (Milanesi et al., 2003), the median price of new VIP latrines was 560,000 Tzs; according to the household survey, 47% of households spent (excluding rent) less than 50,000 Tzs per month (i.e., 55 € in 2002).
- 12 « The EVRI is a searchable storehouse of empirical studies on the economic value of environmental benefits and human health effects » ([www.evri.ca](http://www.evri.ca)). It was created by Canada in the 1990s and joined by other industrialized countries in subsequent years (e.g., France, UK, US, Australia, New Zealand).
- 13 The percentages were 39.6% with open-ended format, 21.9% with a payment card, and 12.2% with the bidding game (different elicitation methods can be used in the same survey).
- 14 Of these surveys, 23.9% were conducted with an open-ended format, 15.9% with referendum, 12.5% with referendum with follow up, 5.7% with payment card, and 5.7% with other methods.
- 15 The starting point is the first bid announced to the respondents (500 in Figure 1).
- 16 In 2002, the sewage network covered in 7.3% of the total town surface. Approximately 10% of households were connected (Milanesi et al., 2003).