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Evidence from a survey on a mandatory health insurance scheme in Tunisia

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Abstract:

The choice of an elicitation format constitutes a crucial but tricky aspect of stated preferences surveys. It affects the quantity and quality of the information collected on respondents' willingness-to-pay (WTP) as well as the potential errors/biases that prevent their true WTP from being observed. Here, we propose a new elicitation mechanism, the circular payment card (CPC), showing that it helps overcome the drawbacks of the standard payment card (PC) format. Indeed, it uses a visual pie-chart representation without start or end points: respondents spin the circular card in any direction until they find the section that best matches their true WTP.

We perform a contingent valuation survey regarding a mandatory health insurance scheme in a middle-income country, Tunisia. Respondents are randomly split into three subgroups and their WTP elicited using one of three formats: open-ended (OE), standard PC and the new CPC. We compare the WTP observed and find significant differences in unconditional and conditional analyses. Our empirical results consistently indicate that the OE and standard PC formats lead to significantly lower WTP than the CPC format. Overall, our results are encouraging, suggesting that further empirical studies could establish CPC as a valid alternative to existing formats, especially for low- and middle-income countries.

Research highlights:

* We propose a new preference elicitation technique: the Circular Payment Card
* We compare its theoretical and procedural properties with existing techniques
* We test its feasibility on a survey dealing with a mandatory health insurance scheme
* We find it a useful alternative, especially for poor and less educated populations.

1. INTRODUCTION

Contingent valuation (CV) surveys reveal respondents' true unobserved willingness-to-pay (WTP) values, provided an appropriate elicitation format is chosen. Since respondents only rely on this component and the hypothetical scenario when making their decision, elicitation can affect the quality and quantity of WTP information collected, as well as potential errors/biases. In particular, the format can introduce implied value cues that directly lead to respondents anchoring on the proposed bids, taken as an indicator of the quality of the good (Boyle et al. 1997) or as plausible values (Herriges and Shogren 1996), even if the numbers proposed are unrelated to the good (Wilson et al. 1996). Implied cues also include a tendency to answer "Yes" ("yea-saying") to avoid answering "No" (Kanninen 1995). None of the various existing elicitation formats stands out from the rest: they provide different types of information, collect different data on WTP (continuous, binary or interval) with its statistical and practical properties (in particular, incentive compatibility), widely discussed in the literature (see Carson and Groves 2011). As Shono et al. (2015) recently stated, "which of these methods is more reliable in the context of low- and middle-income countries remains controversial" (p. 33).

This paper seeks to contribute to the literature on WTP elicitation formats by assessing whether preferences can be elicited effectively by a new technique: the Circular Payment Card (CPC). Unlike the standard Payment Card (PC), the new CPC format uses a visual pie-chart representation without start or end points. Respondents spin the circular card in any direction until they find the section that best matches their true WTP. Here, we test whether this CPC can provide insights into the current debate on Universal Health Coverage (UHC) in Tunisia (Vega 2013; O'Connell et al. 2014). Overcoming the obstacles to UHC is important for governments of low- and middle-income countries, if they hope to tackle health equity issues and allow for health risk-sharing (Who, 2013). Our CV survey asks uninsured Tunisians their WTP for a

mandatory health insurance scheme. We use between-respondent analysis to compare the WTPs elicited using the CPC with those elicited using Open-Ended (OE) and PC formats. Our empirical results consistently indicate that the OE and standard PC formats lead to significantly lower WTP than the CPC format.

The remainder of the paper is structured as follows. Section 2 presents the OE and PC elicitation formats, compares their theoretical and procedural properties, and details the new format proposed. Section 3 describes how the survey was administered, and the statistical and econometric methodology. Section 4 reports the results, which section 5 discusses.

2. COMPARING ELICITATION FORMATS IN CV SURVEYS

Mitchell and Carson (1989) listed nine elicitation formats 25 years ago, but we only discuss the five most used since then, along with their variants.[1] Although the NOAA (Arrow et al. 1993) recommended the *Dichotomous Choice* (DC) format, it has been criticized in the literature for overestimating the mean true WTP[2] as well as for practical reasons. First, it needs an ex ante choice of bids to be proposed (and an inefficient set of bids may affect mean WTP; Kanninen 1995). Second, this elicitation technique carries implied value cues: anchoring, starting point bias or "yea-saying". Thus, it requires larger samples to provide enough information to determine true WTP. Extending the single-bounded version to the *double-bounded version***,** by introducing a second bid conditional on the answer given to the first bid, improves efficiency

[1] The other elicitation methods are the sealed-bid auction, the oral auction, the checklist (similar to payment card) and the spending question offer.

[2] Among the 21 CV studies comparing the DC format with OE and PC formats between 1990 and 2005 and surveyed in Champ and Bishop (2006), none showed lower mean WTP with the former than with the latter two (see also Lunander 1998; Welsh and Poe 1998; Cameron et al. 2002; Carson and Grooves 2007; Frör 2008; Uehleke 2014). Hammerschmidt et al. (2003) is one exception, although on a small sample size (n=73) and for one only of the three diabetic complications assessed in the survey.

but does not remove the implied value cues; it may therefore take large samples to reduce the risk of poor information on WTP distribution.[3] *Bidding games*, in which respondents face several rounds of discrete choice questions involving increasing/decreasing bids (or both, see for instance the "structured haggling technique" proposed by Onwujekwe, 2004), can induce higher extreme responses in addition to implied value cues. These differences explain the lack of consistency in results from different elicitation methods applied to the same dataset (see Cameron et al. 2002). In the following, we choose to focus on the two last formats: *OE* and *PC*.

2.1. Comparing OE and PC

In the OE direct question**,** the respondent provides a monetary value that directly corresponds to a change in utility. This can provide more accurate WTP values than other elicitation methods, as it is not prone to implied value cues. Yet it may be difficult to answer, especially when the purchasing decision involves unfamiliar (non-market) commodities. Moreover, it may lead to a higher non-response rate and to more "Don't know"s and extreme responses than other formats.

In the standard PC (or payment ladder, proposed by Mitchell and Carson, 1981), respondents are required to choose a bid as close as possible to their true WTP from a list with several bids. Respondents answer or tick "Yes", "No" or "Don't know" for each bid. The PC has become popular since it mimics real life decisions (deciding whether or not to buy a good at a given price) better than the OE (deciding the maximum price one would pay for a good). In addition, PC offers visual support that facilitates the construction of evaluation and avoids a high rate of non-response and overestimated values. Although the method reduces the biases associated with closed-ended and bidding formats (especially when starting with very low (or zero) values

[3] Neither the one-and-a-half bound format (see Cooper et al. 2002) nor the triple-bounded format (see Bateman et al. 2001), have been proven to provide substantial improvements (see Bateman et al. 2009).

and ending with very high values), biases due to starting values, the range and the centering of bids may occur. Variants tackle starting-point bias by introducing randomness, like the randomized card sorting first used by Carthy et al. (1999). Respondents sort a set of randomly shuttled cards (with one bid on each card) into three piles: one they would pay for sure, one they would definitely not pay and one they are uncertain about paying.

PC is really the only format that takes respondents' uncertainty directly into account through the WTP elicitation mechanism, and has been improved since 1981. Indeed, Dubourg et al. (1994) propose a two-way payment ladder providing two WTPs: the maximum s/he is definitely willing-to-pay and the minimum s/he is definitely not willing-to-pay. Welsh and Poe (1998) proposed a multiple-bounded DC with five possible answers ("Definitely no", "Probably no", "Not sure", "Probably yes" and "Definitely yes"). Cook et al. (2012) used a traffic light analogy, where green prices mean "sure to buy", yellow prices "uncertain to buy" and red prices "sure not to buy". Further developments by Wang and Whittington (2005) used a stochastic card approach that adds to the five possible answers numeric likelihood values (0%, 25%, 50%, 75% and 100%). Recently, Mahieu et al. (2014) allowed respondents to choose the shape of their uncertainty function (uniform, asymmetric or symmetric triangular).

Regarding empirical results, Whynes et al. (2005) compared five elicitation formats to determine the WTP mass population screening for colorectal cancer: DC, bidding game, OE and two PC formats. They obtained far higher values from the two former than from the three latter formats for median WTP, elasticity and consumer surplus. Veisten and Navrud (2006) applied an induced truth-telling mechanism to study variations in WTP to protect virgin forest areas around Oslo against cutting, depending on the elicitation format used. In addition to an overestimation of WTP with respect to actual payment, they found evidence that a greater uncertainty effect and "yea saying" effect in DC led to higher WTP than with OE. Comparisons between OE and PC have not proved conclusive: OE led to lower WTP than PC in Donaldson

et al. (1997) or Whynes et al. (2003) for health-related goods, but equality or weak evidence of the reverse relationship was found in Lopez-Martin et al. (2008) for environmental goods and Gyrd-Hansen et al. (2014) for an ambulance helicopter service.

2.2. Incentive compatibility of OE and PC

First and foremost, the incentive compatibility issue for direct revelation mechanisms only makes sense for consequential surveys; i.e. "If a survey's results are seen by the agent as potentially influencing agency's actions and the agent cares about the outcome of those actions" (Carson et al. 2007; p.183). *In a strict sense*, incentive compatibility means that the properties of the value elicitation format ensure that there is no advantage in answering strategically: the truthful preference revelation is an optimal (and the dominant) strategy for the respondent – referred to as Theoretical Incentive Compatible (TIC). *In a CV sense*, answers may also depend on the psychological or psychometric properties of the elicitation format – referred to as "Procedural Invariance" (PI).

The OE format has generally been considered as not TIC (see, e.g. Hoehn and Randall 1987): according to Gibbard (1973) and Satterthwaite (1975), no format with more than two alternatives can be TIC without additional restrictions on respondents' preferences (Carson and Grooves, 2007). However, Green et al. (1998) proved that it is possible to make an OE question TIC if the agent thinks s/he has a positive probability of being decisive and if the payment vehicle used is decoupled (see also Schläpfer and Bräuer 2007; for field experiments on this topic) and Riera (2003) showed that the OE format can be TIC when the final decision relies on a quantile of the respondent's WTP distribution (e.g., the median) rather than the mean. The OE format is PI inasmuch as no potential information is given to respondents through bids, but may lead to more zero WTPs when respondents think their true WTP is lower than the cost

anticipated if the good is provided (Carson and Grooves 2007).

The PC cannot be proven to be TIC and may, in rare cases, give rise to very high values. However, Carson and Grooves (2011) conjecture that using a set of values (instead of one) may do two things: turn it into a choice with a sufficiently large number of options to approximate a continuous matching response; and increase uncertainty over the actual cost of the program, which generally favors conservative values.

The PC format is not PI, being sensitive both to the order in which bids are proposed to respondents, so that significantly higher WTP is elicited for the version starting with high values than for the version starting with low values (see e.g. Dubourg et al. 1994, 1997; Smith 2006), and to the range of bids (see Whynes et al. 2004; Covey et al. 2007). However, "yea-saying" is less prevalent in the PC format, where respondents still express support for the proposed good even if they choose a low WTP, as opposed to the DC format, where respondents may disregard the level of the bid proposed in order to express their support (Uehleke 2014).

2.3. An improved PC format: the CPC

Despite recent improvements, there remain disadvantages to the PC format, chiefly the risk of implied value cues from the range of the bid interval, the starting values and the position of the bids. Improvements on uncertainty did not address this, and random card sorting shows very mixed results. For instance, while Covey et al. (2007) found that the range bias can be at least as great as with standard PC, Smith (2006) showed that random card sorting can produce the most 'valid' PC format values, though he did not test for range bias.

To overcome these disadvantages, we propose a new form of PC: *the Circular Payment Card* (CPC). Unlike the standard PC, the CPC relies on a visual representation of a circular card with no predetermined start or end points, no top or bottom, no left or right (see Figure 1 in Appendix

2). The interviewer asks the respondent to think about his/her WTP, and then presents the sheet with the printed CPC in a random position. Respondents are asked to spin it in the direction they want, until they find the section that best corresponds to their WTP values. The text containing the WTP values is curved around the circle to allow easy handling and spinning, with no predetermined direction of rotation. [4]

In addition to the advantages of the standard PC format, CPC eliminates starting-bid bias (because each section is equally likely to be seen at first glance) and middle-card bias (by construction). Following Carson and Groves (2011), it helps strongly reduce the range effect associated with the bids chosen, as the succession of bid ranges mimics a continuous distribution. The circular representation and the spinning reinforce this, and make CPC indisputably more PI than PC. Moreover, spinning the circular card to reach the section corresponding to the *ex ante* WTP chosen requires both cognitive and physical effort, contrary to both the standard PC (increasingly high, easy-to-read bids proposed) and OE (no bid proposed). This may encourage greater involvement during the elicitation process, especially among socially disadvantaged and poorly educated populations. Finally, CPC helps reduce survey costs by being compatible with mail surveys (inserted in the envelope with the survey material) and Internet surveys (displayed on the screen in a random position; respondents spin it as desired by pressing keyboard keys).

3. RESEARCH DESIGN

3.1 Study design

[4] Note that Dubourg et al. (1994) tested for (and found) evidence of starting point bias by using a disk with a small window revealing a single bid at a time, presenting half of the sample with a low starting bid and the other half with a high starting bid. However, this differs crucially from our proposed CPC in which respondents are required to spin the whole CPC until they find their maximum WTP values.

The questionnaire was developed by five researchers specialized in CV and stated preference surveys. After two pre-tests of respectively 20 and 30 respondents, it was fine-tuned for range and centering of bids (PC and CPC) and for wording (in Arabic). The questionnaire consists of four parts. The first introduces the objectives of the CV study and collects general information on the respondents' demographic characteristics, their recent health experiences (health status and utilization of healthcare) as well as the reasons for being excluded from the current health insurance mechanisms. The second part describes the current formal "public single-provider scheme" - run by the "Caisse Nationale d'Assurance Maladie" (CNAM). This scheme covers healthcare services that are only provided by public sector facilities, with a cap on annual co-payments (Makhloufi et al. 2015). Respondents are then asked to reveal their willingness-to-join and their quarterly WTP for this Voluntary pre-payment Health Insurance Scheme (VHIS).[5] The last part collects information on the respondents' socio-economic characteristics, and their comments on the proposed schemes. To ensure comprehension of the questionnaire, the benefits of the health insurance scheme were fully explained by the interviewers (see Appendix 1). All subjects were asked for their full consent to participate in the study and no financial incentives were offered.

3.2 Data collection

The CV study was conducted in Tunisia between August 1st and September 30th 2013. The inclusion criterion was being a Tunisian citizen not covered by – nor benefiting from - any health scheme (including the state-subsidized medical assistance programs). As shown elsewhere (Abu-Zaineh et al. 2013; Makhloufi et al. 2015), the excluded segment of the

[5] In the third part, respondents are asked to choose between two other mandatory insurance plans run by the CNAM, and then to declare their maximum WTP for them. These WTP questions, asked subsequently, cannot influence the initial VHIS elicitation process and we do not exploit them here.

population in Tunisia mainly consists of informal sector employees (Gatti et al. 2011) and the unemployed (18.3%, NIS, 2011). Therefore, to ensure representativeness, two types of sampling location were identified in the three main regions of Tunisia (North, Central and South): (i) the "Souk", where many informal activities take place and (ii) the "Al-mydan" (i.e. public square), the site of many youth demonstrations since 2011 and the so-called "*Jasmine Revolution"*.

We used face-to-face interviews by fully-trained interviewers for two reasons: the surveyed population consists partly of informal employees and rural residents of a developing country (Tunisia), and the survey is complex, comparing different insurance schemes (with questions depending on previous choices and rankings). Of the initial sample of 456 subjects, 30 refused to participate, giving a response rate of 93.42%. The overall sample was then randomly split into three equal sub-groups. Each sub-group was randomly assigned to one elicitation format (OE, PC or CPC) to answer the WTP question for VHIS (see Appendix 2). The same questionnaire was used for all sub-groups, apart from the WTP elicitation format.

3.3 Methods

3.3.1 Descriptive unconditional analysis

The mean WTP obtained from the three elicitation formats (OE, PC and CPC) was compared using a two-sample mean bi-lateral equality test (Ryan et al. 2004). In addition, we tested for equality of median WTP across elicitation formats (Fisher's exact test for p-values) and used a chi-squared test of differences in proportions to test for differences in distribution of the first and the last interval of the payment cards (Champ and Bishop 2006). Lastly, since equality tests are sensitive to distributional assumptions, we performed non-parametric and distribution-free Kolmogorov-Smirnov tests (Chakravarti et al. 1967).

3.3.2 Conditional analysis

We examined differences in elicitation formats by controlling for the determinants of WTP. Some respondents were directly asked for a point estimate of their WTP (OE format), while others were offered an interval with two specified thresholds (PC and CPC formats). The interval regression model (cf. Wooldridge 2002; Anderson and Mellor 2009) was chosen for its ability to handle WTP elicited with all three formats in one single model: exact values in the OE, the interval in the PC formats. All statistical analyses are performed using STATA® 12.1 software and use heteroscedastic-robust standard errors.

4. RESULTS

4.1. Descriptive Results

Table 1 provides descriptive statistics on WTP in addition to respondents' socio-economic, socio-demographic and health characteristics (health status, healthcare utilization and capacity to pay for a given illness). We find significant differences across elicitation formats for several variables (details upon request): *High School* (p-value=0.0157), *Income* (p-value=0.0202), *Equivalised Income* (p-value=0.0425), *Rural* (p-value=0.06), *Disadvantaged Governorate* (p-value<0.001) and *Outpatient Respondent* (p-value=0.0806). Although the elicitation formats are perfectly distributed across interviewers (p-value=0.980), the latter are strongly correlated with Rural, Disadvantaged Governorate and Public Squares. This is because only 5 interviewers covered the three regions of Tunisia studied, generating strongly unbalanced distributions of the characteristics of the 8 sample locations by interviewer. Interviewers' dummies and these three spatially related variables will therefore not enter econometric models simultaneously, due to high collinearity.

On average, respondents belong to households earning about one and a half times the minimum monthly salary in Tunisia (TND 558.11[6]). Interestingly, 49% of respondents reported a lack of insurance coverage due to their professional activities not being officially declared, in line with previous studies suggesting that almost half of Tunisian youth work in the informal sector (Loayza and Wada 2009; Gatti et al. 2011).

[PLEASE INSERT TABLE 1 ABOUT HERE]

4.2. Comparing formats: Unconditional analyses

Table 2 presents descriptive statistics for the three elicitation methods. Our first question is whether more comprehension or completion difficulties arise with the CPC format than with the two others. Equality tests show that CPC does not entail either longer response times or greater difficulties answering WTP questions than OE or PC (see upper part of Table 2).

Second, regarding WTP,[7] the mean for the CPC (WTP_{CPC}) appears to be consistently higher than with the other two formats. Interestingly, using the CPC also yields the highest median WTP (TND 45), while the PC format yields the lowest median (TND 35), with the OE format in between (TND 40).

[PLEASE INSERT TABLE 2 ABOUT HERE]

We test for equality among mean and median WTPs and compute the corresponding p-values. Results reported in the middle part of Table 2 show that both mean and median WTP_{CPC} are

[6] At the time of the survey, 1 Tunisian Dinar (TND) = € 0.455 = $ 0.605.

[7] In this section, we approximate WTP for the two PC formats with the middle of the bid-range elicited (Cameron and Huppert 1989; Yang et al. 2012). The conditional analyses will use the actual lower and upper bounds for these formats.

significantly higher than those of WTP_{PC} and WTP_{OE}. No significant differences are found between the mean and median of the two latter.

[PLEASE INSERT TABLE 2 ABOUT HERE]

Figure 2 shows the whole distribution of WTP by elicitation method. Mean and median WTP roughly summarize overall WTP distribution, and do not inform on extreme values. The OE format is assumed to provide more extreme responses (i.e. lower and higher WTP) than other formats, and the PC to be subject to starting point anchoring. This is tested through pairwise equality of proportion tests on the proportion of answers corresponding to the first (0-10) and the last (more than 130) bid-ranges. Results in the lower part of Table 2 show that the OE elicitation format leads to a significantly higher proportion of low WTP than the CPC (p-value=0.012), but there are no significant differences for high WTP (p-value=0.3496).

[PLEASE INSERT FIGURE 2 ABOUT HERE]

Figure 3 presents the proportion of accepted bids by elicitation method. As shown, the CPC seems to lead to a higher probability of acceptance, which means that the whole distribution of WTP is influenced in an upward direction, not only mean and median WTP. Distribution-free Kolmogorov-Smirnov tests confirm that the OE and the PC elicitation formats do not lead to significantly different WTP distributions (p-value=0.307). However, they reject the null hypothesis of similar WTP distributions of the OE and the CPC formats (p-value=0.006): the OE leads to lower values than the CPC. The hypothesis of similar WTP with the PC and the CPC formats is also rejected (PC leading to lower values than CPC, p-value=0.042).

(PLEASE INSERT FIGURE 3 ABOUT HERE]

Overall, the unconditional analyses provide evidence that the CPC format yields higher mean and median WTP and is less prone to extreme values or anchoring on starting values. However, because these differences could be due to heterogeneity in respondents' characteristics across elicitation formats, in particular regarding income and place of residence (*Rural* and *Disadvantaged Governorate*), we now use interval regression models to control for observed heterogeneity.

4.3. Comparing formats: Conditional analyses

4.3.1. Separate estimations by elicitation format

For each elicitation format, we look for the determinants of WTP with parsimonious models obtained by removing variables step by step, starting from the full models and decreasing p-values (see models 1-3 in Table 3)

[PLEASE INSERT TABLE 3 ABOUT HERE]

In each of the formats, we find a very significant and positive effect of income on WTP - which argues for the validity of the stated preference survey (see Bishop and Woodward 1995) - and evidence of an interviewer effect (with a negative effect for interviewers 2 and 4).[8] Being employed or self-employed (*Work*) has a significant and positive effect on WTP for OE and CPC.

[8] As already mentioned, the interviewer effect also stands for a joint spatial effect. Models with the three spatially related variables instead of the interviewer dummies show no improvement, although the variables *Disadvantaged Governorate* and *Public Squares* are generally positive and significant.

Some variables are significant only for one elicitation format, generally with the expected sign on WTP: positive for *Age*, *RiskAverse* and *Married* and negative for *Elementary*, *NonDeclared* and *Smoke*r.

4.3.2. Joint estimation over the three elicitation formats

We study the impact of the elicitation format on WTP over the whole sample by introducing dummy variables for the OE and the PC formats (the reference being the CPC format). Model 4 in Table 3 contains results indicating a significant and negative effect of the OE and the PC formats, thus confirming the results of the conditional analyses.[9]

Regarding the determinants of WTP, the joint estimation confirms previous results: an interviewer effect (with a negative effect for interviewers 2 and 4), a significant and positive effect of income, *Age*, *Work* and *RiskAverse* on WTP, and a significant and negative effect of *Elementary* and *NonDeclared*.

We finally estimate this model independently on each of the three elicitation formats and test for joint equality of estimates of each variable over the different formats (see last column in Table 3). The overall equality test leads to rejection (p-value=0.0385), because of significant differences between PC and CPC estimates (p-value=0.0089) but not between OE and PC (p-value=0.4128) nor OE and CPC (p-value=0.3175).

5. DISCUSSION

In assessing the efficacy of a new type of payment card, the CPC, this paper highlights the impact of the elicitation format on stated WTP in CV surveys. Conditional and unconditional

[9] Various models with different sets of control variables (survey-specific, socio-demographic, specific to the health respondent, specific to the health of the members of the respondent's family and others, like respondent's risk aversion and reasons for not yet having a health insurance scheme) were also estimated as a robustness check and confirm the results (details upon request).

analyses show that the OE and standard PC formats lead to significantly lower values than the CPC. This provides evidence that respondents may rely on different heuristic decisions when giving WTP in the OE and in the two PC formats (Hanemann 1996; Welsh and Poe 1998; Frör 2008). This may stem from the fact that, faced with an OE question that is not typical of purchasing decisions (i.e. setting the price), respondents need to reflect deeply before giving an amount. The CPC is shown to offer certain advantages: it has better incentive compatibility properties and it seems less prone to extreme values or anchoring on starting values than the PC and OE. Moreover, it is not found more difficult by respondents and does not require more completion time than OE and PC. Consequently, the CPC format may ease WTP elicitation, especially for socially disadvantaged and poorly educated populations. Should our results be confirmed by future studies, the CPC may be a useful alternative to already existing formats for eliciting not only monetary values but any continuous outcome, like discount rate, quality of life or time preference (van de Pol and Cairns, 2008).

Our analysis has several limitations. First, we do not study the criterion validity of the CPC - which is rarely done in the literature, and was impossible here, as VHIS for the uninsured does not exist yet - but only its convergent validity, a less definitive test. The next step should be to determine whether WTPs elicited with the CPC for traded goods or services come closer to actual payments than other formats. Second, we focus on differences across elicitation formats and purposely do not consider protest answers nor true zero WTP, because respondents answered the first willingness-to-join question before the elicitation format was used. However, taking self-selection and true zero WTP issues into account should be part of any WTP modeling aimed at predicting WTP in the Tunisian population. This will be addressed by future research.

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Table 1: Descriptive statistics (n= 426)

Variable definition	Mean (Std. Dev.)
Dependent variables	
WTP = WTP for VHIS (quarterly, in TND)	42.583 (25.338)[a]
Respondent characteristics	
Male = **1** if male, **0** if female	0.669 (0 .471)
Age = individual's age (in years)	35.385 (10.395)
Household size = number of household members	2.599 (2.012)
Child = **1** if at least one child under 5 years old in the household, **0** otherwise	0.134 (0.341)
Elderly = **1** if one person over 65 years old in the household, **0** otherwise	0.052 (0.222)
Married = **1** if Married, **0** otherwise	0.417 (0.493)
Illiterate = **1** No schooling, **0** otherwise	0.023 (0.151)
Elementary = **1** primary school, **0** otherwise	0.213 (0.410)
Secondary = **1** secondary education, **0** otherwise	0.516 (0.500)
High School = **1** higher education, **0** otherwise	0.246 (0.431)
Income = Monthly household income (in TND)	558.11 (464.15)
Equivalised Income[b] = □Monthly income / (Household size)$^{0.5}$□ (in TND)	425.80 (425.72)
Work = **1** if employed /self-employed, **0** otherwise	0.789 (0.409)
Rural = **1** living in rural area, **0** otherwise	0.197 (0.398)
Disadvantaged_gov.[c] = **1** living in disadvantaged governorate, **0** otherwise	0.443 (0.497)
Other variables	
NonDeclared = **1** uninsured due to no declared work, **0** otherwise	0.490 (0.500)
Administration = **1** uninsured due to administrative procedures, **0** otherwise	0.340 (0.474)
NoNeed = **1** uninsured due to no need, **0** otherwise	0.663 (0.198)
RiskAverse = **1** if risk-averse, 0 otherwise [d]	0.885 (0.319)
Respondent-specific health variables	
Self-reported health status = **1** if self-reported health status is good, **0** otherwise	0.835 (0.371)
Outpatient respondent = **1** if at least one outpatient care during the last 3 months, **0** otherwise	0.380 (0.486)
Inpatient respondent = **1** if at least one hospitalization during the last 8 months, **0** otherwise	0.093 (0.292)
Chronic condition = **1** if respondent reports a chronic condition, **0** otherwise	0.124 (0.330)
FinancialHealth = **1** if can afford health services, **0** otherwise	0.370 (0.483)
Smoker = **1** if consuming tobacco products, **0** otherwise	0.460 (0.498)
Health variables specific to the family members of the resp.	
Outpatient member = 1 if at least one outpatient care in household during the last 3 months, 0 otherwise	0.5 (0.500)
Inpatient member = 1 if at least one hospitalization in household during the last 8 months, 0 otherwise	0.140 (0.348)
Chronic condition = 1 if one household member reports a chronic condition, 0 otherwise	0.185 (0.389)
Survey specific variables	
PublicSquare = **1** if sample point is a public square, **0** if informal market	0.420 (0.494)
Interviewer#1-5 = Dummy variables for each of the 5 interviewers	-
Time taken to answer the survey (in minutes)	20.427 (3.000)
Proportion that declares difficulties in answering WTP (in %)	0.4137 (.4932)

[a] Ninety respondents refuse to give a WTP.
[b] Equivalised income is computed based on the OECD equivalence scale, by dividing household income by the square root of household size (see Atkinson et al. 1995).

[c] According to decree n° 2008-387 of February 11, 2008.
[d] Based on six modalities generated according to the method of Barsky et al. (1997).

Table 2 Summary statistics by elicitation format and equality tests between elicitation formats

Elicitation formats	OE (n=107)	PC (n=104)	CPC (n=125)	All (n=336)
Mean survey completion time [SD]	20.393 [2.787]	20.5 [3.131]	20.395 [3.086]	20.427 [3.000]
P-values for equality tests	OE not different from PC (0.7924), PC not different from CPC (0.7999) and OE not different from CPC (0.9946)			(0.9564)
Declare difficulty with WTP questions [SD]	0.4112 [0.4944]	0.4519 [0.5001]	0.384 [0.4883]	0.4137 [.4932]
P-values for equality tests	OE not different from PC (0.5506), PC not different from CPC (0.2989) and OE not different from CPC (0.6727)			(0.584)
Mean WTP [SD] in TND	41.15 [26.64]	38.37 [22.10]	47.32 [26.12]	42.58 [25.34]
Median WTP in TND	40	35	45	40
Equality tests on mean WTP	OE not different from PC (0.4092), CPC>PC (0.0054***) and CPC>OE 0(.0774)*			(0.0220**)
Equality tests on median WTP	OE not different from PC (0.493), CPC>PC (0.009***) and CPC>OE (0.035*)			(0.014**)
Proportion equality test of bid in TND 0-10 range	OE not different from PC (0.2287), PC not different from CPC (0.1912) and OE>CPC (0.0120**)			(0.0406**)
Proportion equality test of bid over TND 130 range	OE not different from PC (0.1632), PC not different from CPC (0.3630) and OE not different from CPC (0.4721)			(0.3496)

NB: Outcome of equality tests with corresponding p-values in parentheses. ** if p<0.05, *** if p<0.01. OE=Open-ended, PC=Payment card, CPC=Circular payment card.

Table 3 Parsimonious models that explain WTP, by elicitation format

	Model 1 (OE)	Model 2 (PC)	Model 3 (CPC)	Model 4 (All)	Joint equality test based on model 4 when estimated by elicitation format
Variables					
OE format (=1)	-	-	-	-6.140** (.023)	
PC format (=1)	-	-	-	-6.821*** (.006)	
Survey					
Interviewer #2 (=1)	-22.243*** (<.0001)	-29.221***(<.0001)	-10.008*** (.005)	-20.587*** (<.0001)	(.1866)
Interviewer #4 (=1)	-12.941*** (.010)	-11.797** (.020)	-	-6. 208** (.014)	(.7097)
Interviewer #3 (=1)	-	-14.385*** (.001)	9.919** (.045)	-	-
Socio demo					
Equivalised Income	.0228*** (<.0001)	.0201**(.025)	.0255*** (<.0001)	.0243*** (<.0001)	(.8663)
Work (=1)	10.966** (.014)	-	11.463*** (.001)	6.896*** (.016)	(.2663)
Age	-	-	.479*** (.001)	.2758** (.046)	(.0445)
Elementary (=1)	-	-9.677** (.018)	-	-5.720* (.058)	(.5330)
Other					
RiskAverse (=1)	13.773*** (.006)	-	-	9.398*** (.008)	(.3916)
NonDeclared (=1)	-	-	-11.971*** (<.0001)	-5.626** (.014)	(.0149)
Married (=1)	9.050* (.081)	-	-	-	-
Health respondent					
Smoking (=1)	-	-6.513* (.059)	-	-	
Constant	12.471** (.041)	46.957*** (<.0001)	16.616*** (.007)	22.289*** (<.0001)	-
Sigma	22.409*** (<.0001)	17.213*** (<.0001)	17.404*** (<.0001)	20.222*** (<.0001)	-
Observations	107	104	125	336	107+104+125
LR test of joint nullity	36.947*** (<.0001)	48.701*** (<.0001)	92.524*** (<.0001)	144.814*** (<.0001)	27.27** (.0385)

P-values in parentheses * if p<0.10, ** if p<0.05, *** if p<0.01, OE=Open-ended, PC=Payment card, CPC=Circular payment card.

Figure 2 WTP distribution by elicitation format

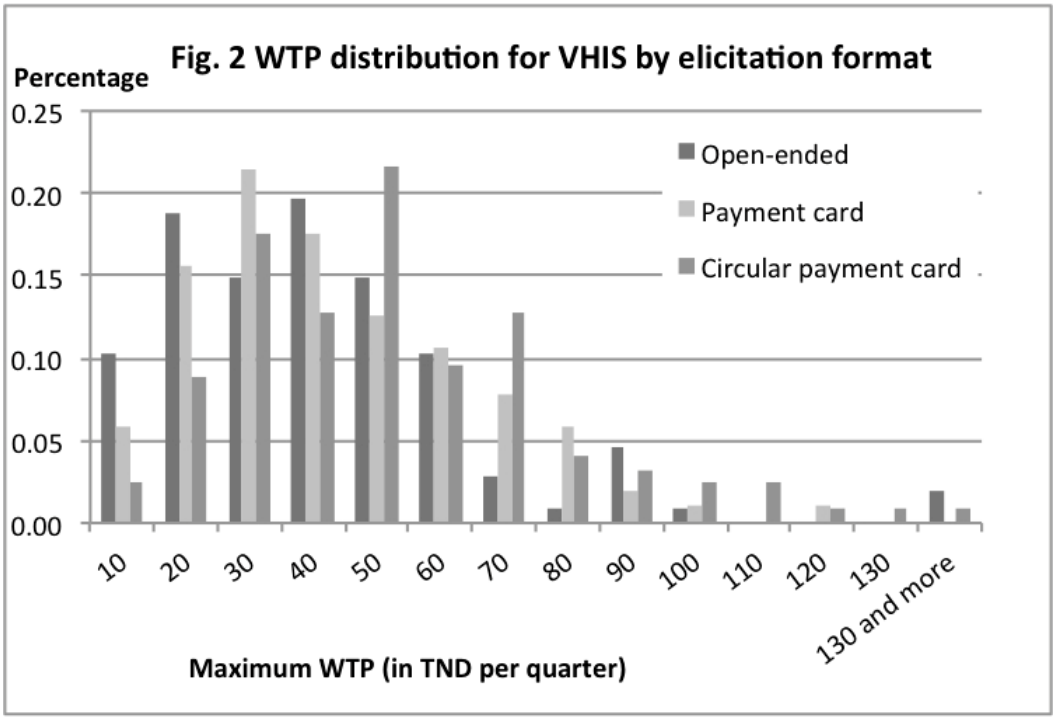
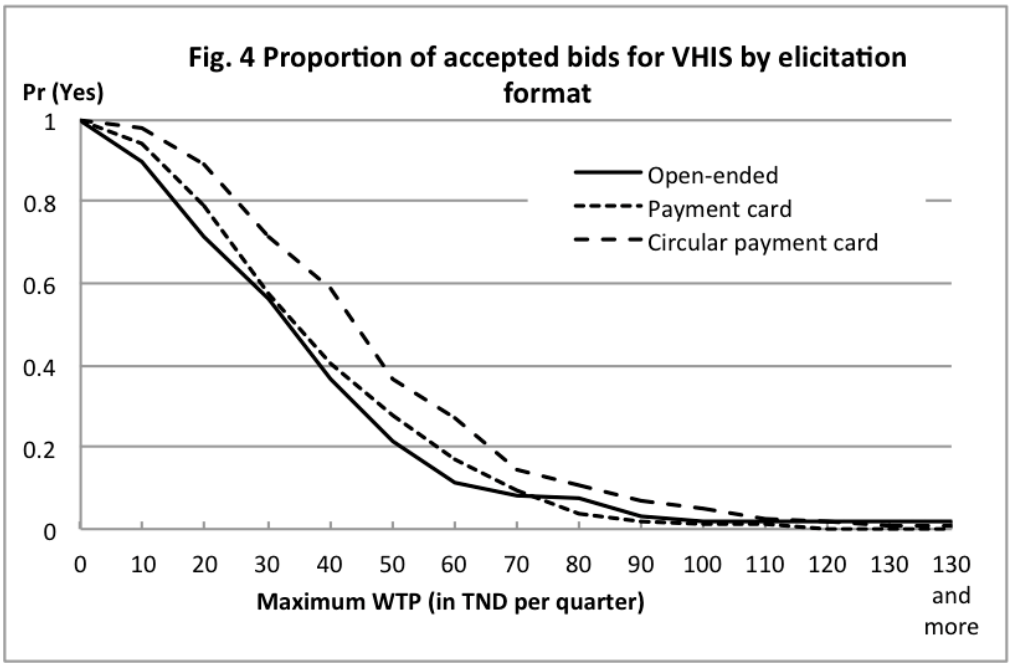


Figure 3 Proportion of accepted bids by elicitation format



Appendix 1: Hypothetical scenario

Introduction by Interviewer:

No one is safe from injury or illness. It is very important to evaluate WTP, because this will allow a new Voluntary Health Insurance Scheme (VHIS) to be implemented. The VHIS covers only healthcare benefits and is not conditional on exercising a professional activity (employed or self-employed). It covers healthcare expenditures of the party insured and his household members, only with public sector providers. It offers a package of healthcare services exactly the same as those offered by the public scheme currently run by 'CNAM'.

Similar to the blue color of the public scheme currently run by the 'CNAM', these healthcare services are described in this blue list: Exoneration from out-of-pocket payment in the event of chronic diseases, births, surgical operations, scanner, medical imaging, hemodialysis, lithotripsy, radiological tests, physiotherapy, orthopedic and thermal healthcare services.

The voluntary public scheme will cover beneficiaries for ambulatory and hospitalization health care services that are provided by the public health sector facilities, with co-payment of 10% of the total healthcare cost.

We will now ask you questions on the amount that you are willing-to-pay to join this new voluntary scheme. The value that you are willing-to-pay represents the importance that you attach to the health insurance scheme and to healthcare services in general. Please note that this amount will reduce your expenditure on other items.

Note to the interviewer: (Please give the interviewee the blue list that describes the scheme under consideration and ask her/him to take time to reply to all the questions]

Appendix 2: WTP elicitation questions

Open-Ended elicitation format

Please answer the following question after carefully reading the scheme description.

The insured will pay their contributions quarterly. Considering your income, what is the ***maximum amount*** *(in TND) that you are willing-to-pay* ***quarterly*** *to join the scheme under consideration?*

Note to the interviewer: (Please fill in the maximum willing-to-pay amount]

/_____/ TND

Payment card elicitation format

Please answer the following question after carefully reading the scheme description.

The insured will pay their contributions quarterly. Of the amounts illustrated on the payment card and considering your income, what is ***the maximum amount*** *(in TND) that you are willing-to-pay* ***quarterly*** *to join the scheme under consideration?*

Note to the interviewer: (Present the payment card] (see below)

0 to 10 T
11 to 20
21 to 30
31 to 40
41 to 50 TND
51 to 60 T
61 to 70 T
71 to 80 T
81 to 90 T
91 to 100
101 to 11
111 to 12
121 to 13
> 130 TN

If more than TND 130, please fill in the exact amount

/_____/ TND

Please tick (√) the interval you are sure you are willing to pay.

Please put a cross (**X)** against the interval you are sure you are not willing to pay.

Please circle (**O)** the interval of the **maximum amount** you are willing to pay.

Circular payment card elicitation format

Please answer the following question after carefully reading the scheme description.

The insured will pay their contributions quarterly. Of the amounts illustrated on the circular payment card and considering your income, what is the ***maximum amount*** *(in TND) that you are willing-to-pay* ***quarterly*** *to join the scheme under consideration?*

Note to the interviewer: (Present the circular payment card] (see Figure 1 below)

Please circle ***(O)*** *the section with the* ***maximum amount*** *you are willing to pay.*

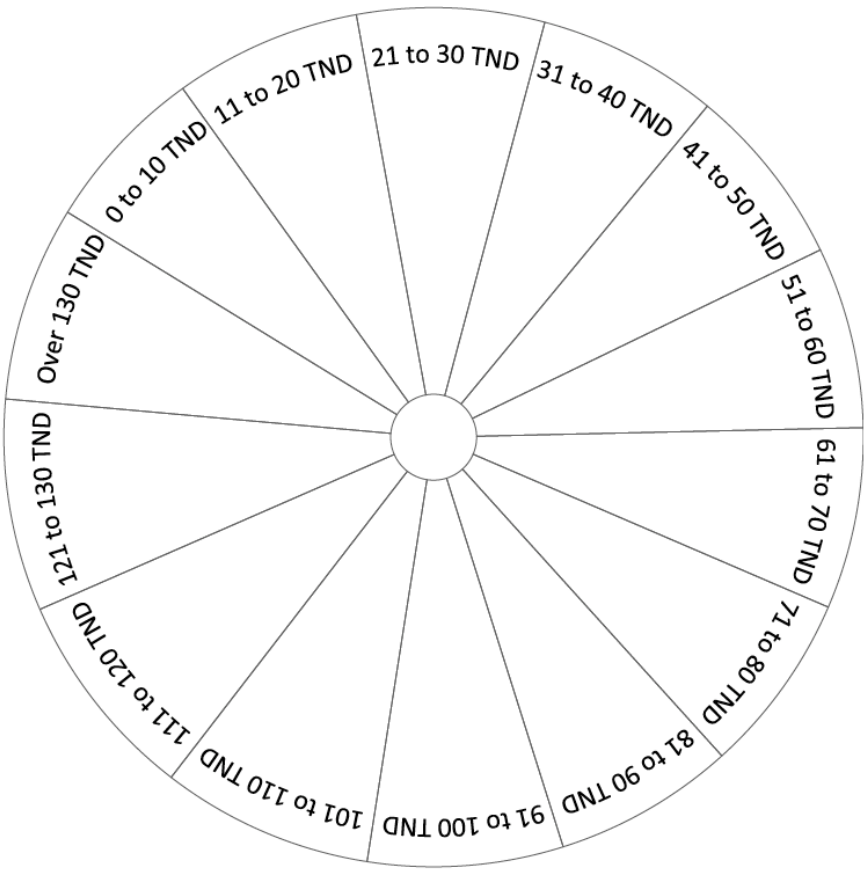


Figure 1 Circular payment card (translated into English)