THE WILLINGNESS TO PAY FOR RENEWABLE ENERGY SOURCES: THE CASE OF ITALY[§]

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Overview

In reference to the Renewable Sources EU Directive 2009/72/CE including targets for 2020 known as "20-20-20". The specific Italian goal, for 2020, is to attain the share of 17% in RES electricity production. To make investment in renewable attractive, the market price must be profitable and the gap between private and social costs of renewable generally has to be filled with "coercive" tools. Obviously, acceptance of such burden may be controversial, because there results a price increase. In such context it becomes crucial to explore the consistency of consumer's WTP to use green energy in the electricity production. This study is founded on a national survey made in November 2007. The paper focuses mainly on how different elicitation affects respondents and on the gaps between different formats concerning bidding game and stochastic payment card.

Methods

In this study we consider Italian household as the typical consumers unit, i.e. households maximize utility subject to budget constraints. The demand for "RES use" can be viewed as any other good or service and therefore we model consumer choice within the utility (expenditure) maximization (minimization) framework. If we allow expenditure to be function of both "RES use" services (R) and a composite good (Z), subject to a utility constraint, we can write the following problem:

$$\text{Min } E(R, Z); \quad \textit{sub. to } U = U(R, Z). \tag{1-2}$$

thus, faced with expenditures for both "RES use" services (R) and a composite good (Z) subject to the utility constraint, the consumer will attempt to minimize the following expenditure function:

$$E^* = E(P_R, P_Z, U) \tag{3}$$

However, given the characteristic of RES it makes sense to think of this as a restricted demand problem where the consumer does not observe P_R and choose R, but rather is offered R and can choose to pay for it or not. Therefore, P_R is replaced with R and then we can rewrite the expenditure function as follows:

$$E^* = E(R, P_Z, U) \tag{4}$$

In this restricted case, the WTP for "RES use" is simply the difference between two expenditure functions with R1 > R0 and the compensating surplus welfare estimate can be derived from the following difference.

$$CS(W_0;W_1) = E(R_0, P_Z, U_0) - E(R_1, P_Z, U_0) \tag{5}$$

This estimate of compensating surplus is a measure of the WTP for "RES use" service. It is the amount that each Italian household is willing to give up and still remain at the previous utility level before the change. In order to derive actual estimates of WTP a national survey with 1.596 interviews was administrated at the end of November 2007, which is a very good period because before 2008-2009 financial crises alters the long run consumers perception. The stratified sample is representative of 46.8 million individuals, residents of Italy. Each respondent was confronted with a range of: (i) general questions concerning RES and their potential development; (ii) questions on knowledge about Italian energy system; (iii) money amounts (bids) in order to support RES development in Italy, ranking in part I of the survey from 5€ to 20€ per electricity bill, with (de)increments by 5€ and in part II of the survey from 0 € to up 200€ per electricity bill. In detail the study designed is summarized in the belowe figure. In our analysis we adopted a "certainty correction method" proposing, in both parts of survey design, five types of acceptance intensity: "definitely yes" and "no" (DY, DN), "probably yes" and "no" (PY, PN) and "not sure or don't know" (DK); to apply the quantitative analysis, the original dataset has been appropriately treated, recoding DK, PN and PY responses. In order to isolate the effect of the two elicitation procedures on the estimated mean WTP in the first part of the survey we conducted additional analyses in which we treated the data obtained from the bidding game at a specific price, from 5 to 20, as if it was the individual's answer to a single referendum question. In the second part order to partially avoid the problem that WTP can be sensitive to the elicitation format, we conducted a second step in which we propose a stochastic payment card approach to respondents. Payment card data may be analyzed in several ways and in particular it is possible to treat the data as interval data because respondents maximum WTP may lie between the value recorded on the card and the higher value of the next card.

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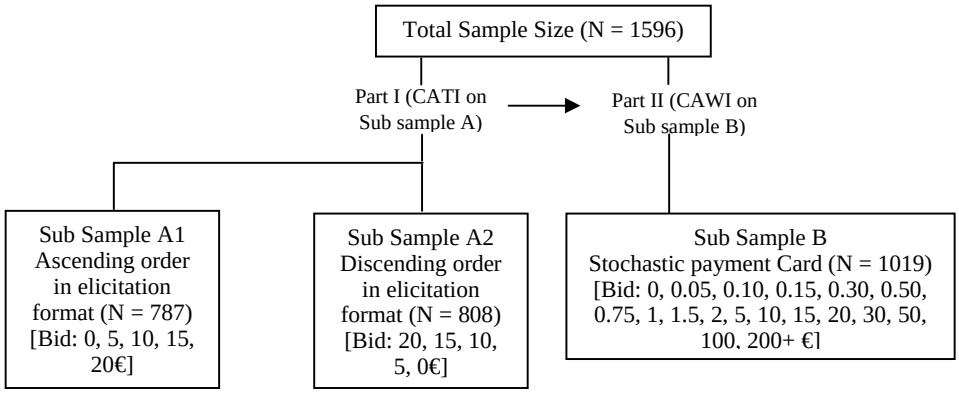

Consequently we use parametric interval regression method (Cameron and Huppert 1989) that is consistent with the next log likelihood function:

$$\log L = \sum_{i=i}^{T} \log[(\Phi((\log t_{ui} - x_i'\beta) / \sigma) - \Phi((\log t_{1i} - x_i'\beta) / \sigma)]$$

(6)

Finally we have estimated the optimal values of β and σ, mean and median WTP (Hanemann - Kanninen, 1999) and we have computed confidence interval according to Krinsky and Robb's simulation model.

Results

Based on the estimated parameters is possible to compute mean and median WTP which are shown in belowe table together with some policy implications. In table 1 we show the individual household mean WTP and we compute the total WTP for Italy, comparing it with an estimate of the total annual subsidy needed in Italy to comply with the UE climate change package for year 2020.

Table 1: Policy implications Sub Sample B

Mean/Median WTP (Euro)	Annual electric bill (Nr.)	Households (Nr.)	Total annual WTP (Euro)	Annual subsidy cost (Euro)	Market sustainability of RES (%)
A) Payment card methods					
1a) No parametric computation					
LBM	3.47		454,098,274		12.97%
KM	6.01	21,810,676	786,492,977	3,500,000,000	22.47%
2a) Parametric estimation					
Interv. Data Regr. (I) model	5.05		660,863,483		18.88%
Interv. Data Regr. (II) model	7.06		923,900,235		26.40%
Interv. Data Regr. (III) model	9.95		1,302,097,357		37.20%

We can see that a measure of the market sustainability of RES , i.e. the cover capacity range, lies between 13% and 37%, according to different estimation models, but a typical result is around 25% of the annual cost.

Conclusions

Concerning policy implication, in previous analysis (Bollino and Polinori, 2007; Bollino, 2009) the findings support the view that in Italy there is some consensus on the development of RES. In monetary value, this consensus is estimated as 35% of the total subsidy cost. In this paper we use more than one econometric procedure in order to obtain more robust statistical results and, consequently, more relevant policy indication too.

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