The willingness to pay for a carbon tax in Italy

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A R T I C L E I N F O

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A B S T R A C T

A carbon tax aimed specifically at the reduction of greenhouse gas (GHG) emissions produced by non-ETS sectors (and in particular, from transportation) has been proposed by policy makers on several occasions but has not yet been implemented in Italy. This paper aims to test the acceptability of such a measure and to quantify its amount by estimating Italian citizens' willingness to pay (WTP) via two contingent valuation surveys involving a sample of 603 people. We find that the median WTP ranges from €101 to €154 if the payment vehicle is an annual fixed carbon tax, and from €0.17 to €0.30 per liter if the payment vehicle is a fuel carbon tax. Such values are found to be consistent with the social cost of the GHG emissions produced annually by an Italian citizen. Earmarking the carbon tax either to mitigate the environmental impacts of climate change or to finance renewable energy projects proves to substantially increase the respondents' WTP. A number of other impacts on the WTP were also estimated, including: respondents' attitudes and beliefs, their place of residence and mobility habits, and various socioeconomic and demographic characteristics. The policy implications of this evidence are discussed.

1. Introduction

In 2017, Italy experienced one of the driest springs on record, with rainfalls as low as 80% less than average levels. Mercogliano (2017) documents that in the period 1982–2016, the mean temperature increased by 0.36 °C per decade. Bucchignani et al. (2016) report evidence of a significant increase in precipitation in colder seasons and a decrease in precipitation in warmer seasons. Fioravanti et al. (2016) describe the period 1961– 2011 as being characterized by a significant increase in summer days, tropical nights, and heat waves, with temperature increase being particularly pronounced in summer and spring. The European Environment Agency (EEA) recommends reducing global greenhouse gas (GHG) emissions by 2050 by at least half the 1990 levels, in order to prevent the most severe impacts of climate change. Although Italy has been able to meet the Kyoto emission targets (Fondazione per lo Sviluppo Sostenibile, 2013) and has reduced its GHG[1] emissions by 17.5% between 1990 and 2016 (from 518 to 428 million of CO_2 equivalent tons, Istituto Superiore per la Protezione e la Ricerca Ambientale, 2018), it is still the fourth-largest GHG emitter among the European countries (Eurostat, 2017). Moreover, GHG emissions from road transport continue to increase due to the rising motorization rate (Fiorito, 2017). More effective environmental policies must therefore be adopted if the goal set by the EEA is to be met.

Governments have a range of tools at their disposal to control GHG emissions, including: regulations, information programs, innovation policies, environmental subsidies, and taxes. As emphasized by the OECD (2011), environmental taxes have many

Abbreviations: ETS, Emissions Trading System; EEA, European Environment Agency; GHG, global greenhouse gas; WTP, willingness to pay

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[1] Excluding emissions and removals from land use, land use change, and forestry.

important advantages in terms of effectiveness, efficiency, revenue generation, and transparency.

In Italy, taxes specifically aimed at reducing GHG emissions (hereafter referred to as carbon taxes) have been proposed by policy makers[2] as the proper measure to deal with climate change, but they have not yet been implemented due to several concerns. A major concern is whether Italian citizens would accept still another tax, despite this being a topic whose relevance is increasingly recognized. A further issue exists with regard to what would be the proper amount for the carbon tax, taking into account both its acceptability and its efficiency.

Both concerns need to be properly researched. To the best of our knowledge, no study exists on the WTP of Italian citizens. This paper will provide an estimate based on 603 face-to-face and online interviews administered between August and September 2017. It will also analyze whether and how the WTP varies depending on how tax revenue is used and on the individuals' sociodemographic characteristics. Two types of carbon taxes will be considered: (1) an annual fixed tax and (2) a tax proportional to fuel consumption for passenger road transport. The consistency of the estimates obtained using these payment vehicles will also be tested. Finally, the WTP estimates will be compared with the social costs of GHG emissions.

The remainder of the paper is organized as follows: Section 2 explains in detail the motivations for the research by reviewing the literature. Section 3 describes the empirical strategy and the data collected. Section 4 illustrates the econometric analysis and the results obtained. Section 5 ends with a summary of the study results, a discussion of the policy implications, and a description of possible future research.

2. Literature review

The superiority of a carbon tax relative to other environmental policies aimed at reducing GHG emissions is well-established in the political, economic, and environmental literature (Liu and Cirillo, 2016; Eliasson and Proost, 2015; Montag, 2015; Rivers and Schaufele, 2015; Stram, 2014; Nordhaus, 2007; Sterner, 2007). Its effectiveness has been demonstrated by several studies (Murray and Rivers, 2015; Di Cosmo and Hyland, 2013; Mori, 2012). Benavente (2016) has recently concluded that a carbon tax ranging from 13 to 22 $/t$CO_2$e would reduce South African emissions by 15%, a tax of 23 $/t$CO_2$e would reduce Australian emissions by 12.4%, and a tax of 27.7 $/t$CO_2$e would reduce Canadian emissions by 12.5%.

However, politicians generally disapprove a carbon tax on the basis that it would have negative effects on the economy (Benavente, 2016; Murray and Rivers, 2015; Cingano and Faiella, 2013; Di Cosmo and Hyland, 2013) and could regressively penalize lower-income segments of the population (Callan et al., 2009; Kerkhof et al., 2008). However, several studies have concluded that a carbon tax is not necessarily regressive. Dissou and Siddiqui (2014) demonstrate that the relationship between inequality and the carbon tax level is U-shaped and that within a certain tax range the policy is actually progressive. Moreover, the burden of the tax depends on how the revenues are recycled and the tax base is chosen (Carattini et al., 2017; Pereira et al., 2016; Williams, 2016; Murray and Rivers, 2015; Mathur and Morris, 2014; Williams et al., 2014; Gonzalez, 2012; Sterner, 2012). With specific reference to Italy, Tiezzi (2001, 2005) found that a carbon tax on transport would not be regressive. Faiella and Cingano (2015) proved that a fuel carbon tax ranging between €60 and €300 per year would actually be progressive: 25% of the tax burden would be borne by the richest 20% of Italian families, while the poorest 20% of families would pay only 8% of the tax.

The acceptability of a carbon tax has been studied both via choice experiments (Carattini et al., 2017; Baranzini and Carattini, 2017; Kallbekken and Aasen 2010) and by analyzing real or hypothetical voting behavior on energy tax proposals (Carattini et al., 2017; Cherry et al., 2012; Thalmann, 2004). According to this literature, a carbon tax is considered less acceptable than other policy measures, particularly when compared to subsidies aimed at supporting environmentally friendly behaviour. However, the acceptability of such a tax can significantly increase if tax revenues are earmarked for environmental purposes and/or if the effectiveness of the tax in reducing carbon emissions is adequately communicated.

Despite the abundant literature analyzing the potential and actual economic and social impacts of a carbon tax, only a few studies have focused on the estimation of the WTP with the aim of properly calibrating this policy measure. As pointed out by Tsang and Burge (2011), the WTP instead reflects people's subjective welfare with regard to carbon reduction, which could be higher than its marginal social or abatement cost, implying that there could also be a positive, even large, consumer surplus (a social benefit) if a tax is introduced to pay for the damages caused by carbon emissions.

Tables 1 and 2 report the main characteristics, methodology, and results obtained in papers whose focus is the estimation of the WTP to reduce GHG emissions. Table 1 focuses on a fixed carbon tax and Table 2 on a fuel carbon tax. These two alternative types of taxes represent a means to internalize the social costs of GHG emissions but have different characteristics and potential impacts.

As reported in Table 1, a fixed tax represents an increase in such things as the cost of living (Duan et al., 2014; Yang et al., 2014; Kotchen et al., 2013; Akter and Bennett, 2011), energy bill (Kotchen et al., 2017), energy and gasoline costs (Berrens et al., 2004), or passenger road transport costs (Gupta, 2016). Such a tax is not related to the quantity consumed of a specific good or service and represents a straightforward and realistic payment vehicle (Akter and Bennett, 2011). However, its consistency with the "polluter pays" principle is admittedly limited.

All studies reported in Table 1 adopt the Contingent Valuation (CV) methodology. Carson et al. (2001) state that CV is one of the most widely used non-market valuation techniques due to its flexibility and ability to estimate the total economic value of non-market

[2] A carbon tax on gasoline and diesel was proposed in 1997 by the Environment Minister Edo Ronchi, in 2012 by the former Italian Prime Minister Mario Monti (who relaunched the proposal in 2017 to the College of European Commissioners to reform the EU budget sources and expenditures), and in 2017 by the former Minister of Economy and Finances Pier Carlo Padoan.

Table 1
Studies on the WTP for a fixed carbon tax.

Authors	Kotchen et al. (2017)	Kotchen et al. (2013)	Berrens et al. (2004)	Akter and Bennett (2011)	Duan et al. (2014)	Yang et al. (2014)	Gupta (2016)
Payment vehicle	Energy bills (per year)	Cost of living (per year)	Energy and gasoline costs (per year)	Household expenses (per month)	Household expenses (per year)	Household expenses (per month)	Costs for passenger road transport (per month)
Methodology: Contingent Valuation	Referendum	Payment card	Payment card	Payment card	Payment card	Payment card	Referendum
Econometric analysis	Binary choice model (logit)	Censored regression model	Bi-variate modeling approach of information and WTP	Binary choice model (probit)	probit and tobit model	Censored regression model	Probit and tobit model
N. obs.	1226	4021	28,055	634	1653	870	321
Country	USA	USA	USA	Australia	China	China	India
Survey period	2016	2010–2011	1999–2000	2008	2009–2010	2012	2014
WTP (annual)	$177	$68–94	$250	$16–62	$32	$50	$109
Age		−	−		−	−	
Gender (male)			+		+	−	
Education		+	+	+	+	+	+
Environmental awareness	+	+	+	+	+	+	+
Political affiliation (Conservative)	−	−					
Income	+	+				+	

Note: Values in 2017 USD ($); Empty cells: insignificant effect or estimates not available; symbol + (−) means that a positive (negative) relationship has been found between the WTP and the individuals' socioeconomic and demographic characteristics.

Table 2
Studies on the WTP for a fuel carbon tax.

Authors	Viscusi and Zeckhauser (2006)	Hsu et al. (2008)	Hersch and Viscusi (2006)	Kallbekken and Sælen (2011)
Methodology: contingent valuation	Payment card (5 values)	Referendum (rating over a 4-level scale)	Payment card (4 values)	Referendum (rating over 5 levels)
Econometric analysis	(censored) regression model	difference-in-means tests and ordered probit model	ordered probit model	ordered probit model
N. obs.	257	797	14,503	1177
Country	USA	Canada	17 European countries	Norway
Survey period	2004	2008	1999	2010
WTP (annual)	\$0.16 per liter	\$0.57 per liter	\$0.03–0.14 per liter	\$0.15 per liter
Age			−	
Gender (male)	+	−		
Education		+	+	+
Environmental awareness			+	+
Political affiliation (conservative)				−
Income		+	+	+

Note: Values in 2017 USD ($); Empty cells: insignificant effect or estimate not available; symbol + (−) means that a positive (negative) relationship has been found between the WTP and the individuals' socioeconomic and demographic characteristics.

resources, including the passive use value components. Although the CV methodology has long been criticized across many disciplines for having a number of shortcomings, many guidelines aimed at carefully describing how to properly design and implement it have been developed over time (starting from the NOAA panel report by Arrow et al., 1993, to more recent reviews authored by Carson et al., 2001; Venkatachalam, 2004; and Johnston et al., 2017), in effect solving most of its alleged problems. Most of these papers make use of the payment card approach, while two of them use the referendum approach. Binary choice models or censored regression models are generally used to analyze the data and to estimate the mean or the median WTP.

It has been found that WTP varies by country. Not surprisingly, in the USA the WTP is much higher than in China. In the USA, it ranges from a minimum of $68 (Kotchen et al., 2013) to a maximum of $250 (Berrens et al., 2004), while in China it ranges from $32 (Duan et al., 2014) to $50 (Yang et al., 2014). Potential explanations are the marked differences in individuals' disposable income and environmental awareness. However, despite their higher income level, Australian citizens have a lower WTP than Indians: the Australian WTP ranges from $16 to $62 (Akter and Bennett, 2011), whereas the Indian WTP is $109 (Gupta, 2016).

Younger, educated individuals with higher income levels and environmental awareness are more likely to be willing to pay for a carbon tax (Wan et al., 2017). Gender has no clear-cut impact. Finally, in some studies, political affiliation is a powerful predictor of environmental policy attitudes, with supporters of conservative parties being less environmentally concerned and less willing to pay for an environmental policy.

Table 2 reports the studies whose focus was the WTP for a fuel carbon tax for passenger road transport. Such a payment vehicle is more strictly linked to the "polluter pays" principle, as it internalizes the social cost of GHG emissions into fuel prices. The drawback of this approach is that it estimates the WTP for a very specific source of GHG emissions (i.e. passenger road transport) and is not directly transferable to other polluting sources such as electricity production and residential heating.

All the studies reported in Table 2 adopt the CV methodology in the form of the payment card or referendum approach. Various model specifications are used including logit, probit, or censored regression models.

The WTP for a fuel carbon tax is particularly high for Canadian citizens ($0.57 per liter), especially if compared to the values found for Europe and the USA, whose maximum estimated values are $0.15 and $0.16, respectively.

Some socioeconomic characteristics, such as being highly educated, affluent, and more environmentally conscious, systematically increase the WTP for a fuel carbon tax. Procedural and distributive fairness and political trust increase individuals' WTP, in line with the findings of Wan et al. (2017).

A different, although minor, stream of literature uses Choice Experiments (CE) instead of the CV methodology. This approach is rooted in Lancaster's characteristics theory of value (Lancaster, 1966), in random utility theory, and in experimental design theory. Respondents are asked to choose among different bundles of environmental and non-environmental goods (scenarios) characterized by different attributes. As argued by Hanley et al. (1998), CE has the ability to directly estimate the trade-offs among the environmental and the non-environmental characteristics proposed in the hypothetical scenarios, and is preferable to CV as long as the attributes to be considered and the levels that they can take are many. However, this is not necessarily the case when the main focus is to estimate the WTP for a reduction of GHG. Moreover, it poses challenges with respect to the design of the experiment to be used and the selection of attributes and levels. Indeed, there are very few applications making use of CE to estimate the value of a one-ton reduction in CO_2 emissions. Liu et al. (2015) use four attributes (tax rates per ton of CO_2, tax relief measures, use of tax revenues, and starting time) in order to characterize two policy scenarios that respondents (201 managers of firms) are asked to choose from. A latent class model is used to estimate the WTP which is equal to 10–30 Yuan/t-CO_2. Akter et al. (2012) also performed a CE aimed at evaluating the acceptance of a carbon pollution reduction scheme interviewing a sample of 307 individuals living in Australia. However, due to the attributes they used,[3] they did not estimate the WTP for a one-ton reduction of CO_2 emissions. More recently, Raux et al. (2015) used a CE to assess the effectiveness of a personal carbon trading system in changing car travel behavior as compared to a carbon tax. On the basis of the 286 interviews they collected in Lyon, they concluded that the effectiveness of the two policies would not significantly differ. However, due to the design used, they were not able to estimate the WTP for a one-ton reduction of CO_2 emissions.

To the best of our knowledge, no study exists on the WTP of Italian citizens for a carbon tax. Recently, Valeri et al. (2016) investigated public preferences for environmental policies in Italy but focused exclusively on measures aimed at reducing PM_{10} and O_3. They found that the factors that most influence policy acceptability are the effectiveness of the policy in reducing the number of premature deaths and the magnitude of the tax.

3. Empirical strategy

In order to estimate the WTP for a carbon tax in Italy, two surveys were conducted via face-to-face and on-line interviews., one aimed at estimating the WTP for an annual fixed carbon tax, and the other aimed at estimating the WTP for a fuel carbon tax. The description of the questionnaires, the samples, and the data collected are presented separately.

3.1. The WTP for an annual fixed carbon tax

The questionnaire consisted of two parts. The first part focused on the respondents' beliefs about climate change, in line with the methodology proposed by Kotchen et al. (2013) and by Akter and Bennett (2011). The respondent was asked to state if she/he believes that climate change is occurring and to what extent it is caused by human activities. Previous research (Moser and Dilling, 2007; Schade and Schlag, 2003) demonstrates that guilty feelings about climate change increase the propensity to adopt environmentally friendly measures.

The second part of the questionnaire was based on a CV exercise asking the respondents about their willingness to pay for a carbon tax. The carbon tax was described as an annual payment which was not conditional to the consumption of a specific good or service and was assumed to be fixed over a period of 10 years. The aim of the question was to assess the acceptability of such a policy and the maximum amount of money that the respondents would be willing to pay for it over a sufficiently long period of time.[4] The question proposed is very much in line with the one used by Kotchen et al. (2013) and was designed in order to enhance the comparability of the results obtained. It reads as follows:

"The government is considering the introduction of a carbon tax policy with the aim of reducing greenhouse gas emissions by 17% by 2020. This policy would increase the cost of living for all Italian households. What is the maximum amount you would be willing to pay each year for the next 10 years to support this policy?

(1) €0; (2) €20; (3) €60; (4) €100; (5) €140; (6) €170; (7) €220;

(8) €335; (9) €425 and more"

Following Hsu et al. (2008) and Kaplowitz and McCright (2015), and with the aim of testing whether the WTP varies according to how the tax revenues are used, the contingent valuation exercise was performed four times for each individual, specifying alternative uses of tax revenue: (a) no earmarking, (b) reduction of the distributional effects of the tax,[5] (c) mitigation of the environmental damages caused by climate change (extreme weather phenomena have recently increased in Italy requiring costly public intervention to control for landslides and reforestation[6]), and (d) financing of projects aimed at developing and supporting new renewable energy sources.

The survey was carried out in September 2017 and 300 respondents were interviewed. Half of the interviews were face to face and had been performed primarily in Friuli Venezia Giulia, a northeastern region of Italy (71%). Some interviews had been collected in other northern (13%), central (4%), and southern (8%) regions of Italy. Railway stations, bus stations, bus stops, service stations, and the Friuli Venezia Giulia airport had been chosen as locations for interviews. The remaining half of the interviews had been conducted via online questionnaires sent via social networks (e.g. Facebook) and instant messaging apps (e.g. WhatsApp).[7]

[3] Specifically: the expected rise in temperature in 100 years, the probability that the temperature rise will be achieved, household expenditure rise per month.

[4] The ten year time horizon has been chosen to enhance the long run framing of the policy in contrast to a one-off tax.

[5] The aim of this item of the questionnaire is to test if the sample is concerned about the potential regressivity of the tax (Williams et al., 2014; Williams, 2016), which is an issue analyzed in previous studies (Callan et al., 2009; Kerkhof et al., 2008) and has the potential to prevent the political acceptability of the tax. The problem is linked somewhat to the acceptability of the double-dividend approach, which hypothesizes that tax proceeds could be used to reduce social security contributions. However, the item was not specifically designed to investigate this additional topic.

[6] The Italian National Plan for hydrogeological risk mitigation, whose aim is to manage the effects of climate change, requires massive investments: €29bn are needed to safeguard the Italian territory and more than 11 thousand construction sites (Grassi & Torsello, 2017).

[7] The NOAA panel (Arrow et al., 1993) recommended face-to-face interviews over telephone and postal surveys; however, at that time the Internet was not widely available. In contrast, the number of Italian households now with access to the Internet is as high as 73% (https://wearesocial.com/it/blog/2018/01/global-digital-report-2018). Taking advantage of the increased diffusion of the Internet, starting from the late '90s several CV

In the sample females, younger and more educated people are overrepresented when compared to the Italian population aged between 18 and 75[8] (Table 3).

Table 3
Annual fixed carbon tax: sociodemographic characteristics of the sample.

Sociodemographic characteristics	Sample description
Gender	Male: 37%, Female: 63%
Age group	Age 18–30: 64%, Age 31–45: 16%, Age 46–60: 13%, Age 61–75: 7%
Education	Middle school: 10%, High school: 52%, Bachelor's or Master's degree: 30%, PhD: 8%
Family income	≤ €20,000: 22%, €20,001 – €40,000: 41%, €40,001 – €100,000: 19%, ≥ €100,001: 2%, Missing value: 16%
Political party	Liberal: 47%, Conservative: 24%, Missing value: 29%
Residential location	Urban: 85%, Rural: 15%

The majority of the sample (97%) believes that climate change is taking place and a striking 95% believe that human activities are responsible for this phenomenon.

Only 5% of the sample (16 people out of 300) stated that they were not willing to pay the tax no matter what the use of the tax revenue was. They are so-called "protest bidders". The prevailing reason for these refusals was mistrust of government with regard to its willingness and ability to use the tax revenues for environmental purposes.[9]

Fig. 1 illustrates on the vertical axis the percentage of respondents (protest bidders excluded) who were willing to pay an annual fixed carbon tax and on the horizontal axis the maximum amount that they are willing to pay. Four types of uses of the tax revenue are considered.

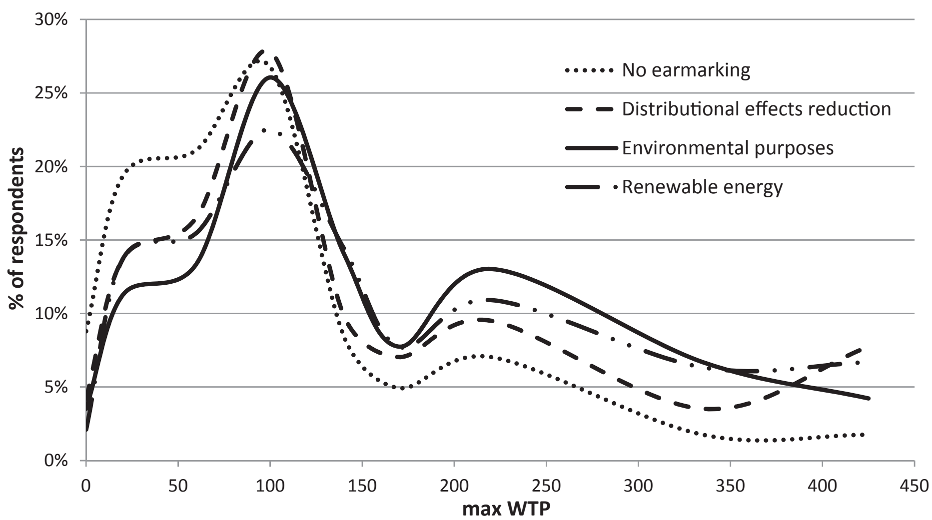

Fig. 1. Respondents and WTP for an annual fixed carbon tax.

(*footnote continued*)
surveys were carried out online, exploiting the lower cost, higher speed, and more interactive and flexible structure of online interviews. Moreover, it has been demonstrated (Nielsen, 2011) that the estimates obtained via face-to-face and online questionnaires are statistically indistinguishable when dealing with air pollution issues. For these reasons, we decided to adopt both methodologies to conduct our experiment. A detailed description of the respondents involved in the face-to-face interviews and of those answering the online questionnaire is provided in the Appendix (Table 8 and Fig. 3).

[8] This might be due to the fact that half of the data have been collected using online questionnaires. According to the Italian National Institute of Statistics (http://dati-censimentopopolazione.istat.it/Index.aspx#), the Italian population aged 18 – 75 is characterized as follows: 50% men, 23% aged 18 – 30, 39% aged 31 – 45, 36% aged 46 – 60, and 2% aged 61 – 75. Thirty-seven percent hold a middle school certificate, 46% hold a high school diploma, and 17% hold a Bachelor's or Master's degree.

[9] The percentage of males among the protest bidders is slightly higher compared to the rest of the sample. Moreover, the protest bidders are relatively older, less educated, have a lower income level, commute less frequently by car or by scooter, have a lower sensitivity to environmental problems, and have a very mild sense of responsibility with regard to the climate change phenomenon. A detailed description of the differences between the protest and non-protest bidders is provided in the Appendix (Table 7).

The percentage of people whose WTP is equal to zero ranges from 2% to 9%. Such values are much smaller than the percentage of people who Kotchen et al. (2013) found to have a WTP equal to zero (which was 31% of the sample in their study). The highest frequency corresponds to an annual fixed tax of €100. The tax revenue destination influences the stated WTP: the highest WTP values are reported when “environmental purposes” or “renewable energy” are indicated as uses of tax revenue.

3.2. The WTP for a fuel carbon tax

The first part of the questionnaire used for this survey is identical to the one described in section 3.1, while the contingent valuation question proposed in the second part of the questionnaire reads as follows:[10]

“The government is considering the introduction of a carbon tax on fuel with the aim of reducing greenhouse gas emissions by 17% by 2020. In May 2017, the average price per liter of gasoline and diesel was €1.53 and €1.38, respectively. What is the maximum tax value that you would be willing to pay per liter of fuel for the next 10 years?

(1) €0, (2) €0.07 [+ 5%], (3) €0.15 [+ 10%], (4) €0.22 [+ 15%],

(5) €0.29 [+ 20%], (6) €0.44 [+ 30%], (7) €0.58 [+ 40%], (8) €0.73 [+ 50%],

(9) €0.87 [+ 60%], (10) € 1.02 and more [+ 70% and more]”

The maximum tax value listed in the payment card, which is €1.02 per liter, is equal to 70% of the average gasoline and diesel price at the time of the interview.

In the second survey, the contingent valuation exercise had been administered four times to each individual, changing the description of the use of the tax revenue in each choice setting as described in Section 3.1.

The choice of testing for this specific payment vehicle is due to the fact that according to Santos (2017), in Italy the ratio between the current excise tax and a corrective one internalizing all the external costs caused by road transport is 60% for gasoline and less than 45% for diesel (Fig. 13 and 14, p. 131). The second reason is that this payment vehicle is highly consistent with the “polluter pays” principle, which should characterize as much as possible any environmental policy.

A total of 303 interviews were collected in August 2017. Half of them were personal interviews that had been performed in Friuli Venezia Giulia in popular gathering places: railway stations, bus stations, bus stops, service stations, and the regional airport. The remaining interviews had been administered via online questionnaires.

The majority of the sample (93%) stated that climate change is taking place and 86% strongly believe that the phenomenon is caused by human activities.

In the sample females, older and more educated people are overrepresented as compared to the Italian population aged between 18 and 75 (Table 4).

Table 4
Fuel carbon tax: sociodemographic characteristics of the sample.

Sociodemographic characteristics	Sample's description
Gender	Male: 42%, Female: 58%
Age group	Age 18–30: 26%, Age 31–45: 26%, Age 46–60: 36%, Age 61–75: 12%
Education	Middle school: 17%, High school: 48%, Bachelor's or Master's: 30%, PHD: 5%
Family income	≤ €20,000: 20%, €20,001 – €40,000: 50%, €40,001 – €100,000: 26%, ≥ €100,001: 4%
Political party	Liberal: 42%, Conservative: 50%, Missing value: 8%
Residential location	Urban: 76%, Rural: 24%

The percentage of “protest bidders” (23%) was higher in the second survey than in the previous one.[11] This result is partly due to the fact that in Italy, the end-use taxes on fuel consumption for passenger road transport are already quite high, equal to 62% and 59% of the end-price paid for gasoline and diesel, respectively (data relative to June 2018 as reported by the International Energy Agency, 2018). However, when asked to describe their reasons for refusal, the majority of the “protest bidders” stated that they feared that the government would misuse the tax revenues. A much smaller group declared that they were concerned about the impact the policy could have on low-income segments of the population, or that they didn't want to pay taxes at all.

[10] For comparative purposes, the GHG reduction target and the time horizon are those used by Kotchen et al. (2013), which are consistent with the targets proposed by the European Environmental Agency.

[11] Similar to what was found in the previous survey, the percentage of males among the protest bidders is quite high. Moreover, it was confirmed that the protest bidders were relatively older, less educated, with a lower income level, a lower sensitivity for environmental problems, and had a very mild sense of responsibility with regard to the climate change phenomenon. However, in contrast to the previous case study, they tend to commute slightly more frequently by car or by scooter than the rest of the sample. A detailed description of the differences between the protest and non-protest bidders is provided in the Appendix (Table 7).

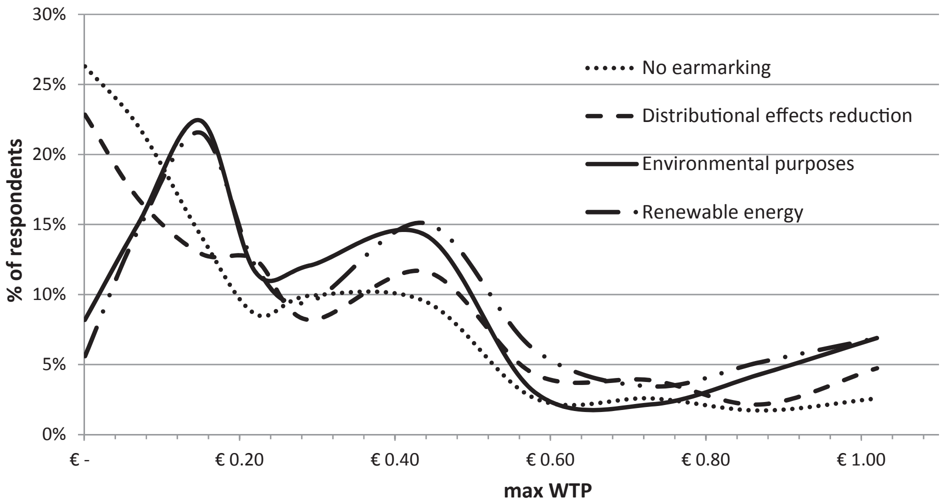

Fig. 2. Respondents and WTP for a fuel carbon tax (€ per liter).

Fig. 2 illustrates on the vertical axis the percentage of respondents (protest bidders excluded) who were willing to pay a fuel carbon tax and on the horizontal axis, the maximum amount that they are willing to pay. Each use of tax revenue is depicted separately. The percentage of people whose WTP is equal to zero ranged from 6% to 26% according to the proposed use of tax revenue (which strongly influenced the stated WTP). Unspecified use corresponds to lower WPTs.

4. Results and discussion

An econometric analysis of the survey responses was performed in order to assess whether and how the sociodemographic characteristics of the respondents and the earmarking of the tax revenues influence individual preferences for a carbon tax.

According to our literature review, logit or probit models are frequently used to analyze CV data (Kotchen et al., 2017; Gupta, 2016; Akter and Bennett, 2011) as an alternative to (or in addition to) censored regression models. The use of logit or probit models has been a standard practice since the late 1980s when analyzing this kind of data (Loomis, 1988; Kristrom, 1990; Adamowicz et al., 1998). In CV surveys, the stated WTP value is implicitly the outcome of a binary choice that the respondent makes between paying or not paying the proposed amount of money. When the respondent's preferences are collected via payment cards characterized by N values, the stated WTP describes the outcome of N binary choices. It is implicitly indicating that the respondent would also be willing to pay (choose) any value described in the card that is smaller than the stated (chosen) one and that she/he would not be willing to pay (not choose) any higher value. From this perspective, the advantage of using logit or probit models instead of censored regression models is that each stated WTP corresponds to N binary choices, which enables us to obtain more efficient estimates of the parameters to be studied. This is similar to the "explosion process" proposed for rank-ordered choice sets described by Chapman and Staelin (1982). Moreover, if random logit or probit models are used, it is possible to more effectively trace the respondents' preference heterogeneity since it is possible to specify the parameter of the proposed values as being random rather than fixed. For the sake of completeness, in the Appendix (Table 9) we have reported the results we have obtained by also analyzing the data via a censored in both tails regression model.

In the first experiment focused on an annual fixed carbon tax, 32 observations were collected for each respondent, since for each of the four policy scenarios we proposed 8 fixed carbon tax amounts: €20, €60, €100, €140, €170, €220, €335, and €425. For the second experiment, we collected 36 observations from each individual. In fact, for each of the four tax revenue uses, we proposed 9 fuel carbon tax amounts: €0.07, €0.15, €0.22, €0.29, €0.44, €0.58, €0.73, €0.87, and €1.02. In both cases, the logit models have been specified to take into account the repeated observations collected from each respondent. Overall, the number of observations equaled 10,908 and 9600, respectively (protest bidders included).

The variables used to specify the logit models represent: (1) the tax amounts, (2) the tax revenue use, (3) attitudes and beliefs (human responsibility for climate change, environmental awareness, political affiliation),[12] (4) place of residence and mobility habits (place of residence, car ownership, commuting by car), and (5) socioeconomic and demographic characteristics (gender, age, education, occupation, income).

[12] Beliefs refer to the views held by an individual that are accepted by specific people or groups and that dictate whether behaving in a particular fashion is appropriate. Attitudes are favorable or unfavorable cognitive evaluations, emotional experiences, or behavioral tendencies that people constantly hold/display with regard to certain situations or ideas (Fang et al., 2017).

Table 5
Mixed logit model estimates for the two datasets (standard error in brackets).

Description of the explanatory variables and of the estimated parameters (β_s)	Fuel tax (€/l)	Fixed tax (€/y)
Constant	−0.21 (0.55)	−0.52 (0.62)
Amount of the carbon tax (€, expected value of the triangular distribution)	−40.47*** (1.99)	−0.06*** (0.00)
Use of tax revenue (dummy with respect to "no earmarking")		
b) reduce distributional effects of the tax	0.72*** (0.11)	1.38*** (0.12)
c) mitigate environmental impacts of climate change	1.69*** (0.12)	1.78*** (0.12)
d) finance renewable energy projects	2.02*** (0.12)	1.82*** (0.12)
Attitudes and beliefs		
Beliefs about human responsibility for climate change (ordinal categorical variable from 0 = not responsible to 3 = highly responsible)	0.26*** (0.09)	0.38*** (0.12)
Environmental awareness (dummy)	0.30 (0.23)	0.57** (0.26)
Political affiliation (dummy, 1 = conservative, 0 = liberal)	−0.001* (0.00)	−0.001*** (0.00)
Place of residence and mobility habits		
Living in rural vs. urban areas (dummy)	−0.55*** (0.18)	−0.06 (0.25)
Car ownership (dummy)		1.01*** (0.29)
Commuting by car (dummy)	0.22 (0.17)	−0.49*** (0.20)
Socioeconomic and demographic characteristics		
Gender (dummy: 1 = male, 0 = female)	−0.66*** (0.17)	−1.24*** (0.19)
Age (ordinal categorical variable from 1 = 18 – 30 years old to 4 = 61 – 75 years old)	−0.31*** (0.12)	−0.50*** (0.14)
Education (ordinal categorical variable from 1 = middle school to 4 = PhD)	0.45*** (0.12)	0.74*** (0.12)
Self-employed vs. employee (dummy)		0.74** (0.40)
Student vs. employee (dummy)	0.56** (0.30)	0.10 (0.26)
Unemployed vs. employee (dummy)	−0.01 (0.28)	−0.72** (0.33)
Retired vs. employee (dummy)	1.61*** (0.32)	−0.13 (0.41)
Income level (ordinal categorical variable from 1 = lower than €20,000 to 4 = higher than 100,000)	0.66*** (0.12)	
Income level average (dummy: 1 = €20,000 - €40,000)		0.94*** (0.21)
Income level above average (dummy: 1 = €40,001 – €100,000)		1.76*** (0.28)
Income level high (dummy: 1 = above €100,000)		1.31** (0.69)
N. Obs.	10,908	9600
Adj. Rho^2	0.65	0.62

Note: *, **, *** indicate statistical significance at the 90%, 95%, and 99% levels, respectively.

The carbon tax parameter was specified as having a random triangular negative[13] symmetrical distribution, while all other parameters were specified as fixed ones. The inclusion of the random parameter allowed us to better account for the preference heterogeneity.

The value of the carbon tax parameter was estimated at the individual level on the basis of the estimation of both the distribution of the random parameter (expected value and spread) and of the choices made by each respondent (Table 5).

Both models fit the data very well (adjusted Rho^2 equal to 0.65 and 0.62, respectively). The parameters have the expected sign and most are statistically significant. An exception in both models is the constant, which is not statistically significant, meaning that there is no systematic bias in accepting\refusing the alternatives proposed, regardless of their content.

The expected value of the triangular distribution describing the carbon tax parameter is negative, implying that the higher the value of the tax, the less the willingness to pay for it.

The parameters referring to the revenue-use specification significantly influence the willingness to pay for the tax, in line with the results obtained by Kaplowitz and McCright (2015), Kallbekken and Sælen (2011), Kallbekken et al. (2011), Sælen and Kallbekken (2010), and Hsu et al. (2008). It is worth noting that recycling fiscal revenues through income tax rebates to mitigate the distributional impacts of the tax, instead of using them to mitigate the environmental impacts of climate change, is relatively unpopular. This is consistent with evidence reported by Dresner et al. (2006)[14] and Carattini et al. (2017). The econometric analysis allows us to conclude that investing the tax revenues to support technologies aimed at the creation and use of cleaner energy sources is preferable than any other proposed use, especially with regard to the survey targeting the fuel carbon tax. Our results are consistent with the findings reported by Cherry et al. (2014), according to which the acceptability of a carbon tax increases if the tax revenues are used to reduce the cost of alternative energy

[13] The triangular distribution was chosen because it avoids excessive and unrealistic large absolute values of the random parameter. More specifically, we allowed the mean of the distribution to be a free parameter, β. However, we fixed the two endpoints of the parameter distribution (defining the range of the triangular density function) to be equal to 0 and 2β, respectively. This implies that the mean of the distribution of the random parameter is a free parameter, while the variance is not.

[14] As suggested by Tsang and Burge (2011), the public prefer that tax revenues are spent on measures that they can understand, such as developing renewable energy and mitigating the environmental impacts of climate change, rather than shifting tax revenues from one area to another area.

sources and to increase their availability.

With regard to the "attitudes" and "beliefs" variables, there appeared to be a positive and significant relationship between a respondent's stated WTP and their belief in humanity's contribution to climate change, in line with the findings of Diederich and Goeschl (2014), Akter and Bennett (2011), Kallbekken and Sælen (2011), and Moser and Dilling (2007). In addition, environmental awareness (measured by the respondent's subscription to environmental events or associations) significantly increases the WTP for an annual fixed carbon tax. This is consistent with the results of all of the studies reported in the literature review that specifically take into account this factor (Tables 1 and 2). Political affiliation also plays a role, albeit a minor one.

As for the residential and mobility variables, living in rural rather than urban areas negatively affects the WTP only when a fuel carbon tax is the payment vehicle. The result is probably due to the fact that urban residents are more likely to be exposed to air pollution caused by road transport and look more favorably on fiscal policies aimed at reducing the consumption of gasoline and diesel. Car ownership and commuting by car have an impact only on the WTP for an annual fixed carbon tax. More specifically, owning a car significantly increases the WTP for a carbon tax, while regularly using it to commute negatively influences the WTP.

Finally, several sociodemographic variables turned out to significantly affect the WTP for both forms of carbon taxes. Higher WTPs are estimated for women, younger people, better-educated, and higher-income respondents.

4.1. Median WTP by tax type and revenue use

The parameters of the logit models reported in Table 5 and the individual specific estimates of the carbon tax parameter allow us to calculate the median WTP at the individual level (i.e. the tax that each individual is willing to pay with a probability equal to 0.5). Averaging the individual estimates, we obtain the sample median WTP by tax type and by revenue use as reported in Table 6. We opted for estimating the median WTP instead of the mean WTP because (as pointed out by Kristrom (1990) this method is robust with regard to tail behavior (i.e. observations far off the median). This methodology also permits consistent evaluation of policy acceptability issues.

The sample median WTP for an annual carbon tax ranges from a minimum of €101 to a maximum of €154 depending on the tax revenue uses considered. The sample median WTP for a fuel carbon tax ranges from a minimum of €0.17 per liter, which is 12% of the average end-price of gasoline and diesel in May 2017, to a maximum of €0.30 per liter (20% of the end-price).

Table 6
Sample median WTP (standard deviation in brackets).

	No ear-marking	Mitigate distributional impacts of the tax	Mitigate environmental impacts of climate change	Finance renewable energy projects
Median WTP (€/y) for an annual fixed carbon tax	101	141	153	154
	(97)	(130)	(139)	(140)
Median WTP (€/l) for a fuel carbon tax	0.17	0.22	0.27	0.30
	(0.24)	(0.30)	(0.37)	(0.41)

Since the average fuel consumption for passenger road transport in Italy is 603 L per person per year (Ministero dello Sviluppo Economico, 2018), the median annual fuel tax would correspond to a minimum of €102 and a maximum of €181. Hence, the results of the two surveys using different vehicle payments appears to lead to similar WTP estimates.

Since no study exists for Italy, only a cross-country comparison can be made (Table 1). Our estimates for the annual fixed carbon tax lie between the values reported by Kotchen et al. (2017) and those found by Berrens et al. (2004) for the USA, which are equal to €57-149 and €211, respectively. However, these are higher than the values obtained by Akter and Bennett (2011) for Australia, equal to €14-19.[15] The difference between the Australian estimates and those found in our study might be due to the fact that the policy scenarios for which we obtained the highest WTP estimates comprise environmentally-oriented uses which, as reported by Hsu et al. (2008), tend to significantly increase the tax acceptability. Akter and Bennett (2011) did not test the impact of the tax revenue use.

The estimates for the fuel carbon tax are in line with the results reported in the literature (Table 2).

4.2. Comparison between the WTP for a carbon tax and the social cost of GHG emissions

Finally, it is interesting to compare the estimated WTP benefits with the social cost of the GHG produced annually in Italy. The annual production of CO_2 per inhabitant is equal to 6.7 tons (Istituto Superiore per la Protezione e la Ricerca Ambientale, 2018). As argued by Nocera and Cavallaro (2014; 2016) and Nocera et al. (2015), the monetary value of the social cost of GHG emissions is uncertain and the validity of estimates controversial. Using the estimate proposed by the Environmental Protection Agency (2016) of \$36 t/CO_2 eq., the annual social cost of GHG emissions caused by an Italian citizen is equal to €200 per year. This value is almost twice the WTP for a carbon tax without earmarking. However, it is comparable with the WTP we have estimated if the revenues are used to

[15] 2017 average exchange rate for the dollar/euro is equal to 0.887

mitigate the environmental impacts caused by climate change or to finance renewable energy projects. These results demonstrate that the introduction of a carbon tax could not only be acceptable, but also consistent with the goal of internalizing the social cost of climate change and increasing social welfare, along the lines of what has already been suggested by Tsang and Burge (2011).

5. Conclusions

Although in Italy GHG emissions have been substantially reduced over the last two decades, they are still too high if the European Environmental Agency's goal of reducing them by half of the 1990 level is to be met by 2030.

In order to test the acceptability of introducing a carbon tax in Italy and to quantify its value, two contingent valuation experiments were performed. To the best of our knowledge, this paper provides the first WTP benefit estimate of such a policy for the Italian context. We find that the median WTP ranges from €101 to €154 if the payment vehicle tested is an annual fixed tax and from €0.17 to €0.30 per liter if the payment vehicle is a fuel carbon tax. Quite encouragingly, the tax amount resulting from the two surveys is very similar in terms of annual cost for a representative Italian citizen and corresponds to the social cost of the GHG emissions, thereby providing further evidence of the efficiency gain that would be achieved by implementing such a policy. Moreover, our estimates are comparable with most of the international estimates presented thus far in the literature.

Earmarking the carbon tax to mitigate the environmental impacts of climate change, in particular with respect to the hydrogeological risk characteristic of the fragile Italian territory, or to increase investments in renewable energy sources, increases the respondents' WTP. Similar results have been reported by Sælen and Kallbekken (2010) and Kallbekken and Sælen (2011).

The respondents' attitudes and beliefs, place of residence and mobility habits, and various socioeconomic and demographic characteristics impact the WTP for the two vehicle payments considered. The respondents' beliefs about human responsibility for climate change and their environmental awareness significantly and positively increase the stated WTP, while political affiliation plays a minor role. Living in rural rather than urban areas negatively affects the WTP when a fuel carbon tax is the payment vehicle. Car ownership and commuting by car have an impact only on the WTP for an annual fixed carbon tax. Finally, higher WTPs are estimated for women, younger people, and respondents who are better-educated and have higher income levels.

It needs to be further stressed that the acceptability of a carbon tax is greatly influenced by government credibility, the perceived effectiveness of the tax, by the information available on climate change, and by the degree to which human activities are believed to contribute to climate change. The tax will not be accepted if the purpose of the tax is not clearly and extensively explained before it is implemented, and if its expected impacts, both on the environment and on the economy, are not adequately described. Provided that an appropriate information campaign is organized, the inevitable initial reluctance to accept a carbon tax might diminish over time. As suggested by Cherry et al. (2014), a trial run could increase the acceptability of such a policy. Unfortunately, the current stance of the Italian government is to reduce the existing fuel excise duties, quite in contrast not only with the insights of our results, but also with the government's stated goal of reducing the market share of internal combustion vehicles while also increasing the market penetration of electric vehicles. Our evidence suggests that fuel taxes shouldn't be reduced (if anything, the opposite) and that at least part of the fuel tax revenues should be used to finance renewable energy projects, which in the end could also enhance the desired uptake of electric vehicles.

The major limitation of our research is the admittedly small sample size (603 people). For this reason, caution should be used when extending the results obtained to the general population of Italian citizens. However, our estimates could be useful as a starting point for future experiments, since to the best of our knowledge, no other study has been carried out on this topic in Italy. We intend to carry out additional interviews using a stratified random sampling technique in order to better account for the preference heterogeneity potentially caused by the different per capita incomes and lower degrees of environmental consciousness which characterize the currently underrepresented regions of central and southern Italy. A more detailed description of the revenue recycling scheme aimed at reducing the distributional effects of the policy could also be provided, in order to better test the sensitivity of the Italian population with respect to this specific topic. An additional promising line of research would be to focus on specific population segments such as air travelers, who are large GHG emission contributors, along the lines of research conducted by Lu and Shon (2012) and Higham et al. (2016).

Appendix A

See Fig. 3 and Tables 7–9.

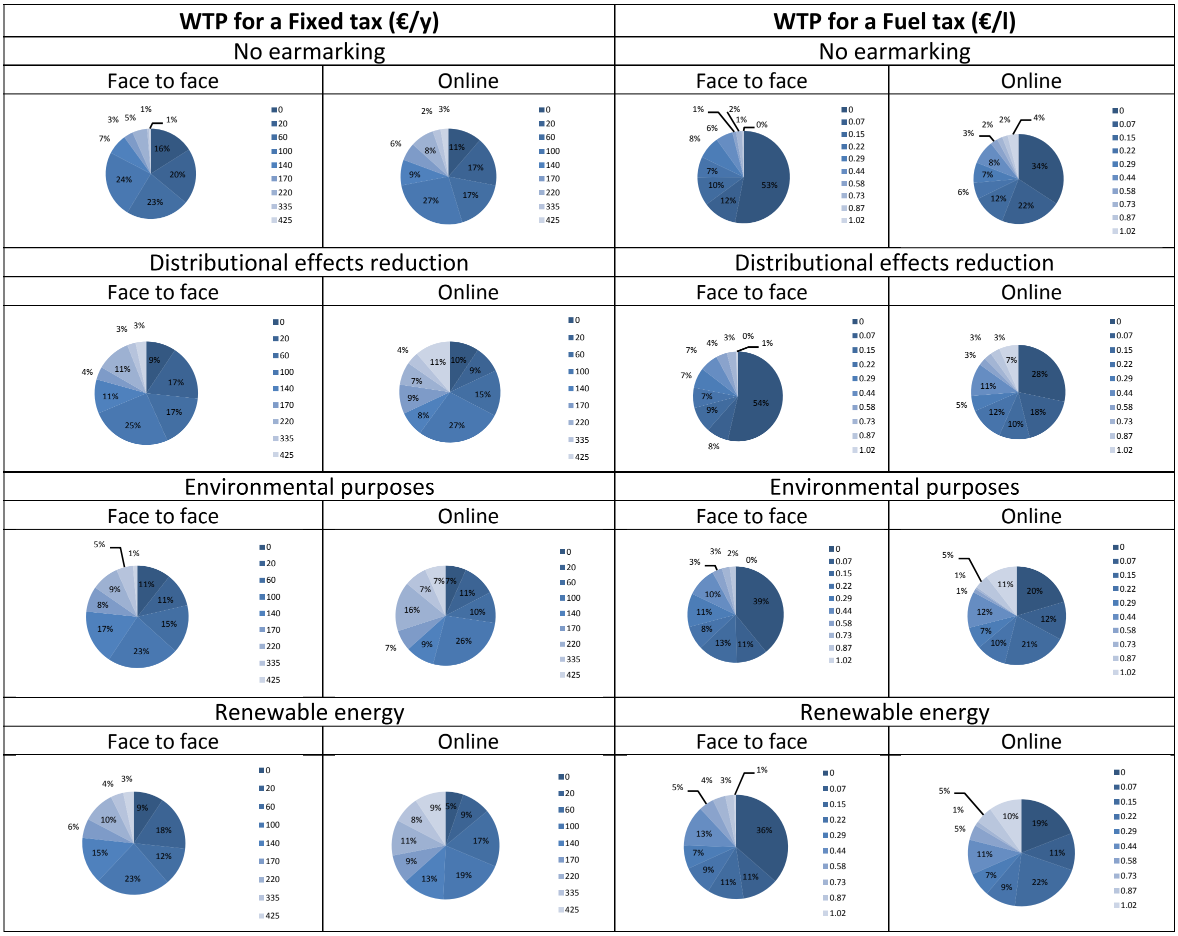

Fig. 3. Stated WTP for a fixed (€ per year) and a fuel carbon tax (€ per liter) by type of interview and tax revenue use.

Table 7
Description of the socio-economic characteristics of the two samples by "protest bidders" and "nonprotest bidders".

Description of the socio-economic characteristics	Fixed tax (€/y)		Fuel tax (€/l)	
	Protest bidders	Nonprotest bidders	Protest bidders	Nonprotest bidders
Number of respondents	16	284	71	232
Gender: male (female)	44% (56%)	37% (63%)	54% (46%)	39% (61%)
Age				
18–30	31%	66%	13%	30%
31–45	6%	16%	23%	28%
46–60	50	11%	52%	31%
61–75	13%	7%	12%	11%
Education				
Middle school		9%	34%	12%
High school	38%	52%	41%	50%
Bachelor \ Master	31%	30%	25%	32%
PhD	31%	9%		6%
Occupational status				
Employee	44%	30%	56%	53%
Self-employed	6%	7%	17%	9%
Student	19%	52%	6%	18%
Unemployed	12%	6%	11%	9%
Retired	19%	5%	10%	11%
Income level				
Missing value	50%	14%		
< €20,000	25%	21%	34%	17%

(*continued on next page*)

Table 7 (*continued*)

Description of the socio-economic characteristics	Fixed tax (€/y)		Fuel tax (€/l)	
	Protest bidders	Nonprotest bidders	Protest bidders	Nonprotest bidders
€20,000 - €40,000	25%	42%	42%	52%
€40,001 -€100,000		20%	24%	26%
> €100,000		2%		5%
Place of residence and mobility habits				
Living in rural (urban) areas	19% (81%)	15% (85%)	32% (68%)	22% (78%)
Car\scooter ownership: yes (no)	69% (31%)	90% (10%)	92% (8%)	93% (7%)
Commuting by car\scooter (by other transport modes)	19% (81%)	39% (61%)	63% (37%)	55% (45%)
Attitudes and beliefs				
Beliefs about human responsibility for climate change: strong (no or mild)	78% (12%)	96% (4%)	76% (24%)	91% (9%)
Environmental awareness: high (low)	0% (100%)	20% (80%)	6% (94%)	17% (83%)
Political affiliation: conservative (liberal; *missing*)	19% (6%; *75%)*	24% (49%; *27%)*	52% (42%; 6%)	44% (42%; 14%)

Note: protest bidders are those respondents that stated that they were not willing to pay any amount of money no matter what the purpose of the tax revenue was mainly due to mistrust in the government or to other ideological reasons.

Table 8
Description of the socio-economic characteristics of the two samples by type of interview: face to face vs. online.

Description of the socio-economic characteristics	Fixed tax (€/y)		Fuel tax (€/l)	
	Face to face	Online	Face to face	Online
Number of respondents	150	150	151	152
Number of protest bidders (% over all sample)	10 (3%)	6 (2%)	48 (16%)	(8%)
Gender: male (female)	40% (60%)	35% (65%)	52% (48%)	33% (67%)
Age				
18–30	41%	87%	16%	36%
31–45	25%	6%	29%	24%
46–60	20	7%	37%	36%
61–75	14%		18%	4%
Education				
middle school	16%	5%	22%	12%
high school	42%	61%	42%	54%
Bachelor \ Master	27%	32%	32%	28%
PhD	15%	2%	4%	6%
Occupational status				
employee	47%	15%	56%	51%
self-employed	8%	5%	15%	8%
student	25%	75%	6%	24%
unemployed	8%	5%	6%	12%
retired	12%		17%	5%
Income level				
missing value	31%			
< €20,000	18%	25%	17%	25%
€20,000 - €40,000	35%	49%	54%	45%
€40,001 -€100,000	15%	23%	26%	26%
> €100,000	1%	3%	3%	5%
Place of residence and mobility habits				
Living in rural (urban) areas	13% (87%)	17% (83%)	34% (66%)	14% (86%)
Car\scooter ownership: yes (no)	85% (15%)	93% (7%)	93% (7%)	92% (8%)
Commuting by car\scooter (by other transport modes)	36% (64%)	39% (61%)	56% (44%)	57% (43%)
Attitudes and beliefs				
Beliefs about human responsibility for climate change: strong (no or mild)	94% (6%)	96% (4%)	84% (16%)	89% (11%)
Environmental awareness: high (low)	19% (81%)	19% (81%)	13% (87%)	16% (84%)
Political affiliation: conservative (liberal; *missing*)	20% (41%; *39%)*	29% (51%; *20%)*	50% (42%; 8%)	51% (41%; 8%)

Table 9
Censored regression model estimates for the two datasets (Standard Error in brackets).

Description of the explanatory variables and of the estimated parameters β	Fuel tax (€/l)	Fixed tax (€/y)
Constant	−0.14* (0.08)	74.24* (38.97)
Tax revenue use (dummy with respect to "no earmarking")		
b) reduce distributional effects of the tax	0.07*** (0.02)	43.67*** (6.57)
c) mitigate environmental impacts of climate change	0.14*** (0.02)	49.53*** (7.32)
d) finance renewable energy projects	0.18*** (0.02)	54.52*** (6.08)
Attitudes and beliefs		
Beliefs about human responsibility for climate change (ordinal categorical variable from 0 = not responsible to 3 = highly responsible)	0.02 (0.01)	11.18 (7.38)
Environmental awareness (dummy)	−0.03 (0.03)	48.95*** (11.65)
Political affiliation (dummy, 1 = conservative ; 0 = liberal)	−0.0001*** (0.00001)	−0.02* (0.01)
Place of residence and mobility habits		
Living in rural vs. urban areas (dummy)	−0.06** (0.03)	17.73 (12.42)
Car ownership (dummy)		24.11 (17.25)
Commuting by car (dummy)	−0.01 (0.02)	7.86 (10.55)
Socioeconomic and demographic characteristics		
Gender (dummy: 1 = male; 0 = female)	−0.11*** (0.02)	−27.99*** (10.68)
Age (ordinal categorical variable from 1 = 18–30 years old to 4 = 61–75 years old)	−0.07*** (0.02)	−43.17*** (7.16)
Education (ordinal categorical variable from 1 = middle school to 4 = PhD)	0.09*** (0.01)	2.84 (5.92)
Self-employed vs. employee (dummy)		36.93* (20.47)
Student vs. employee (dummy)	0.14*** (0.03)	−46.27*** (13.20)
Unemployed vs. employee (dummy)	0.11*** (0.04)	−37.22 (23.80)
Retired vs. employee (dummy)	0.29*** (0.05)	25.56 (25.77)
Income level (ordinal categorical variable from 1 = lower than €20,000 to 4 = higher than 100,000)	0.02* (0.01)	
Income level average (dummy: 1 = €20,000-€40,000)		17.18 (11.42)
Income level above average (dummy: 1 = €40,001-€100,000)		83.45*** (13.12)
Income level high (dummy: 1 = above €100,000)		39.53 (29.80)
Sigma (v)	0.18*** (0.002)	60.83*** (0.80)
Sigma (u)	0.32*** (0.01)	91.19*** (3.39)
N. Obs.	1212	1200
Wald test (χ^2)	762.77 (P = 0.00)	616.24 (P = 0.00)

Note: *, **, *** indicate statistical significance at the 90%, 95% and 99% levels, respectively.

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