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Managing Transportation Externalities in the Pyrenees Region: Measuring the Willingness-To-Pay for Road Freight Noise Reduction using an Experimental Auction Mechanism

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Abstract

The estimation of the noise impact caused by road freight transportation is critical to have acknowledgment of the ambiance pollution caused by road traffic crossing geographical areas containing important natural resources. Thus, our work proposes a within-subject survey where a Contingent Valuation Method (CVM) is combined with a laboratory economic experimental auction. Our study objective is to measure the willingness-to-pay (WTP) for reducing traffic noise nuisances due to freight transportation in the region of Navarre, Spain. A special focus is made regarding the measurement of the hypothetical bias, when a comparison is done between hypothetical WTP, coming from the CVM study, with real-incentivized one, as the outcome of the economic experiment. Additionally, statistical analyses are conducted in order to find explanation factors for these outcomes. Results suggest a strong evidence for an upward hypothetical bias (from 50% to 160%) indicating the income, the educational level, the gender, and the age as the main factors which explain that bias.

Keywords: Willingness-To-Pay; Transportation Externality; Noise; Contingent Valuation Method; Laboratory Economic Experiment

1. Introduction

After the industrial revolution, freight transportation became a key sector in industrialized countries, as a basic determinant for economic and social activities. This key role of transportation has been enhanced in the European Union during the period 1990-2015 with the development of new transportation regulations. The transportation main function is connecting consumers and producers by promoting specialization and accessibility to a wide variety of merchandises. Moreover, from the social point of view, the importance of leisure-related activities makes transport an essential action for human relationships development.

Furthermore, time and cost savings, among others, are the direct benefits derived from freight transportation system, which presents a greater interest in transport literature. However, the real cost of moving freight from the raw material sources, the manufacturing or distribution centers and to consumers is borne not only by the stakeholders, such as logistic company owners, but also by other members of society who may not benefit directly from these movements. In the economic literature, this is known as negative externalities (Demir et al., 2015). Additionally, following some meaningful authors (Xiao et al. 2012; Demir et al. 2014; Perveen et al. 2017), the consideration of this kind of nonconventional costs has traditionally been scarce and its analysis has not reached the depth that its significance would be advisable.

Negative externalities are particularly significant in road transportation crossing geographical areas of special natural value. One of these areas are the Pyrenees in Europe, natural border between Spain and France, which has also a high density of road traffic, mainly trucks. In fact, more than 140,000 vehicles cross daily the Pyrenees (circa 90% using the two main motorways which reach the border in Irún-Behovia and La Junquera, Western and Eastern extremes of the mountainous range respectively), being freight trucks almost 30,000 of them (Spanish-French Observatory of Pyrenees Traffic, 2015). Moreover, the noise and air pollution costs are, at least, four times higher in mountainous areas in comparison with flat areas (INFRAS, 2017). Similarly, Demir et al. (2015) listed some negative externalities associated to freight transportation such as noise or air pollution (mainly CO_2 emissions). Thus, these authors provided a selection of models to measure, at different levels of accuracy, their impacts in terms of decibels, in the case of noise, or fuel consumption, when estimating CO_2 emissions. Nevertheless, there is not enough literature to reach a consensus regarding the economic values of these freight transport externalities since the valuation processes are data-intensive and requires a good deal of subjective judgement (McKinnon et al., 2015).

These economic values are indeed a necessity if public authorities want the implementation of cost-benefit analyses in possible regulations, levels for taxes and subsidies, or in transport infrastructures investments. In this case, implementing efficient transport systems need proper adequate assessment of external costs, as optimal transport policies imply necessarily the computation of adequate social

marginal costs, as the sum of marginal private costs and of marginal external costs (Nijkamp et al, 2003; Willis, 2005). Likewise, it is necessary to consider that there are many different ways to assign monetary values to externalities, but most of them followed the methodology called 'Damage Function Approach' (Adamowicz, 2003) that assumes that the externality damage has already been done. However, in most cases, the damage caused by logistic activities in the environment cannot be directly observed. This is often developed using the so-called 'Impact Pathway Approach' (European Commission, 2003). This scheme begins with the calculation of emissions originated from logistic activities, tracking their diffusion and, in the case of gases, their chemical conversion and concentration at different spatial scales. Usually, the following step is a review of the receptors' response, such as people, animals, vegetation, physical objects, to these emissions. These responses will normally be negative, representing a welfare loss. Hereafter, those losses have to be quantified and translated into monetary values to consider them into public decision-making processes during the implementation of transport policies.

Overall, there are two valuation methods in externalities costs estimations (Boyle, 2003). The first one is related to Revealed Preference (RP) studies in which an environmental cost is inferred from current changes in people's behavior (using, for example, the hedonic pricing methods, see e.g., Andersson et al., 2010). The second one is the Stated Preference (SP) surveys, in which participants are asked for their willingness-to-pay (WTP) in order to remove an externality, or at least to mitigate its negative effects. The WTP methodology looks for the maximum monetary amount that an individual is willing to pay to avoid an undesirable event (Wang et al., 2018; Bazrbachi et al., 2017). The Contingent Valuation Method (CVM) is often used, consisting in a stated-preference technique in which respondents are asked for their willingness to pay to pass from a current environmental scenario to a contingent (hypothetical) one with better environmental characteristics.

The CVM, however, presents some drawbacks due to the fact that the survey context could be considered to be artificial because the respondents' real WTPs may be different from what they are answering. Concerning this methodology, there had been a large discussion in the literature regarding the concept of "hypothetical bias" that states a potential gap between real and hypothetical individual economic valuations (Murphy et al., 2005). Carson and Groves (2007) have argued that the correct opposition between methods is about the consequences of the survey. Actually, as defined by Carson and Groves (2007), a survey is 'consequential' if (i) the agent answering a preference survey question must view their responses as potentially influencing the agency's actions, and (ii) the agent needs to care about what the outcomes of those actions might be. If one of the previous conditions is absent, then the survey is 'inconsequential'. It could be disputable to consider that stated preference in a CVM survey are really consequential, given that participants do not know precisely how, when and how much the possible policies/actions will impact their personal situation regarding the peculiar problem they are asked about. Nevertheless, these possible consequences are rarely explicitly and precisely stated for respondents. In order to cope with an explicit and precise consequence, it is used the

experimental economics method for two reasons. The first one is the implementation of immediate and real outcomes (money) for noise reduction scenarios depending on participants' choices. The second one is to enable a group decision-making process for resources that should be used for increasing a public commodity related to noise mitigation. On one hand, the motivation of the current study is based on the importance of noise in road transportation and its difficulty of estimation of the payment for the noise abatement in areas of great environmental impact as the Pyrenees Mountains. On the other hand, the main contribution is that, to the best of authors' knowledge, this paper is the only one to use an experimental auction procedure that guarantees incentive compatibility to measure willingness-to-pay for freight noise reduction. Actually, as explained by Cummings et al. (1997): "An allocative mechanism or institution is said to be incentive compatible when it rules provide individuals with incentives to truthfully and fully reveal their preferences". In a laboratory economic experiment in the UPNA (Public University of Navarre) premises, respondents were endowed with real money that actually was paid as their WTP. It also enables us to make a comparison of this experiment with the results of a Contingent Valuation Survey by implementing a within-subject analysis. Trying to give a first insight of the results, it is found that respondents exhibit a significant hypothetical bias, that is to say a hypothetical WTP being much greater than real WTP, and that a minor but significant part of them are zero protesters. Additionally, several explanatory variables of this bias have been identified and analysed. Thus, this paper is structured in the following way: Section 2 reviews the related literature with transport externalities and their corresponding WTP; while Section 3 presents all the details of our survey design. Additionally, Section 4 provides the empirical results related to the survey and Section 5 performs the results discussion. Finally, Section 6 provides the concluding outcomes.

2. Literature review

Research interest in freight transportation externalities has continuously expanded because of the increasing impacts on economy, environment, climate, and society. For example, Ranaiefar and Regan (2011) classified truck negative externalities in the four groups: firstly, social externalities, which include noise pollution, accidents and visual intrusion; secondly, economic externalities that address congestion, road damages, and longer travel times; thirdly, ecologic externalities, which account for climate change and biodiversity destruction; and finally, environmental externalities for air pollution, water pollution and waste products. For a deeper description on main negative road freight transportation externalities, the reader is referred to Demir et al. (2015), who present a painstakingly analysis of the main transport externalities.

A large set of methods can be considered in order to measure stated or revealed values regarding non-market goods, e.g., nuisances, such values being either a willingness-to-pay to obtain a certain reduction of damage level or a willingness-to-accept a certain increase in this damage level (Horowitz

and McConnell, 2003). Other important references related to noise pollution caused by activities related to transportation are Malvestio et al. (2018), Rajeev et al. (2017), and Sen et al. (2017).

2.1. WTP for Noise in the transportation sector

Broadly speaking, the first characteristic in WTP elicitation through CVM is the discrepancy of stated values from a situation to another one. One of the initial studies regarding the evaluation of transport externalities costs was done by Wardman and Bristow (2004), who made stated preference studies of the monetary valuations of traffic related noise and air quality. Recent studies by Instamto et al. (2014a,b), with more than 5,200 respondents in five countries in the European Union (including Spain) provides WTP estimates for noise reduction having a median value between 20 and 40 euros. Restricting the scope to Spain, and in the same geographical area as the one presented in this study, Lera-Lopez et al. (2013), surveying 900 people, measured the mean WTP for noise reduction to be 8.22 euros, and being around €12.78 for respondents living in a high-polluted area close to highways and exposed to a noise reduction scenario from 70dB to 50dB. This study has partly followed the Lera-Lopez et al.'s (2013, 2014) methodology and has implemented a survey in the Pamplona area (Navarre, Spain) in the surroundings of the Spanish Pyrenees.

Thus, Lera-Lopez et al (2013, 2014), found, in their study in a similar scenario in Navarre (Spain) with different noise levels, an average WTP rather low regarding the expected values in the literature: €9 on average based on 900 surveyed people. This result was also analogous to Arsenio et al. (2006) and Sanchez et al. (2018). Correspondingly, they also observed a high proportion of zero protests (around 66%), i.e., people who consider that either they are not responsible for the noise control policy or they are already paying enough taxes, what would imply a refusal to pay anything else. Likewise, a well-established fact is that the mean response is generally greater than the median of the same survey results, which reveals that the statistical distribution that fits those data is positively skewed. This situation is due to the high frequency of zero answers.

In contrast, Istamto et al. (2014a) report a different range of mean and median values for WTP for noise reduction, which are respectively, €75 and €0, in a more generic scenario where respondents were confronted to the information regarding the noise effects in health, such as heart attacks, severe sleep disturbance, severe annoyance, or poor reading performance for children. A consequence of this description of real disturbances of noise on health, they managed to obtain higher values of WTP, even considering that their survey does not give any precise health impact regarding pollutants or noise as reported in this study.

2.2. Hypothetical bias for noise damage in the transportation sector

The hypothetical bias refers to a situation where individuals state different amounts of willingness-to-pay or willingness-to-accept for identical choices that differ only in the associated commitments. In one case, there is a real commitment for the individual (for instance, to receive or to pay a certain

amount of money for making a choice) and on the other case, there is no commitment at all for the respondent (Hensher, 2010). Or much easier, it could assert that hypothetical bias can be defined as the difference between stated and revealed values (Murphy et al., 2005). Therefore, two questions arise about this hypothetical bias: the first one is related to its magnitude, the second one is concerned about the factors that potentially explain it. Generally speaking, it is agreed that the evidence supports the claim that hypothetical valuations exceed real valuations. Thus, Harrison and Rutström (2008), surveying 35 studies, computed the hypothetical bias (defined as the ratio hypothetical stated value over the real one -1) between -46% to 2600%, but concluded that there is a clear upward bias for hypothetical methods. In the field of transport environmental impacts, there had been even much more debate about the existence of such a bias (Fifer et al., 2014).

3. Geographical scope and design of the experimental survey

3.1. The survey geographical scope

This study is focused on the Autonomous Community of Navarre in Northern Spain. The Navarrese region is located next to the border between Spain and France, being one of the seven European regions next to the Pyrenees: Catalonia, Aragon, Navarre, Basque Country, Aquitaine, Midi-Pyrenees, and Languedoc-Roussillon, apart from the Principality of Andorra. The first four regions are Spanish, while the following three regions take part of France, being Andorra an independent country. The selected study area was chosen because of its importance as a natural boundary between Spain and France, and crossing the Pyrenees is a challenging task for the transportation activities of logistic companies who want to move merchandises from the Iberian Peninsula to the rest of Europe, or vice versa. Thus, more than 130,000 vehicles, almost 25% of which are freight trucks, cross daily the Pyrenees (Spanish-French Observatory of Pyrenees Traffic, 2015). In fact, the Pyrenees is a region with very dense road transportation traffic, with the busiest routes located close to the mountains in Catalonia (La Junquera), and the Basque Country and Navarre (Irún-Behovia) (Figure 1.a).

Figure 1. Geographical scope: Importance of Navarre in the Freight Transportation crossing the Pyrenees.

Fig. 1.a. Map of freight transportation crossing the Pyrenees in both directions. The bolder is the line, the more intensive is the traffic.
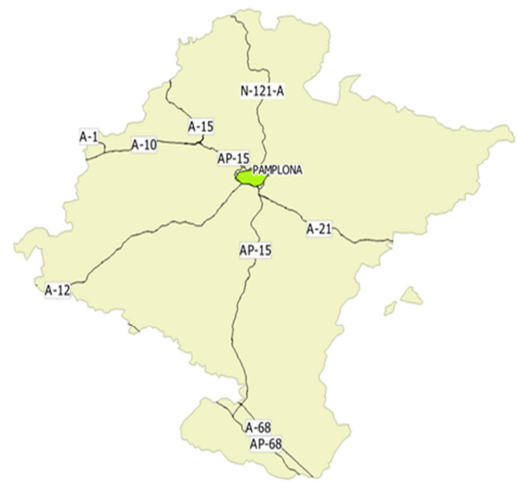

Fig.1.b. Map of Navarre showing the main transportation routes for trucks.

These routes cut through areas of great ecological value. Currently, these crossing points are greatly impacted as a result of road traffic. This research focuses on the main international routes crossing the Pyrenees in Navarre. Thus, five main routes are considered (Figure 1.b), all crossing Pamplona (the capital of Navarre) and ending in France. These routes, which pass through various towns and villages, include from highways with heavy traffic to quiet national routes.

3.2. Survey general description

From a generic point of view, the survey combines a within-subject design by implementing both a hypothetical valuation survey (CVM) and a real-money economic experiment. For the real-money experiment, the Horowitz's (2006) method was chosen, which implements a group presentation format. Technically speaking, the survey development took place in two large computer rooms that were available at the Public University of Navarre, in Pamplona (Spain). The selection of people taking part in the survey is based on the importance of having participants of different ages, income levels, and interests. Respondents for the survey came from two sources: i) newspaper advertisements and ii) a special call for the students at the Public University of Navarre made by their students' representatives. Other participants were contacted by different methods in order to increase the candidates' diversification in the selection process, but the two previously cited sources explain the origin of 85% of the participants. However, this selection procedure presents a great difference between the whole population in Navarre, and the selected sample, in young people (9.87% in population versus 52% in our sample) and old people (39% in population versus 4% in our sample) percentages. The reason of this bias in young and old people in due to the calls we made to participate in our experiment: general call to students in the UPNA (Public University of Navarre) and

advertisements in the local newspapers. Nevertheless, this bias was caused on purpose to avoid underestimating the WTP. According to Sanchez et al. (2018), Lera-Lopez et al. (2012), and Istamto et al. (2014a,b), there a risk of underestimation of WTP in a list of countries which includes Spain. Therefore, having the purpose of obtaining an accurate value for WTP, a greater percentage of young people were selected, because they are usually prone to give higher values of WTP in environmental externalities mitigation.

Two successive sessions were carried out on June 7, 2014. Each session included 25 participants and took approximately 90 minutes. At the beginning of each session, each participant received written instructions that were read aloud by one of the experimenters. These instructions explain as clear as possible the entire sequence of actions that any survey respondent has to follow (see the Appendix A about the instructions for CVM and the economic experiment). These actions are also described in the following subsection.

The main characteristics of the survey respondents are depicted in the Table 1. With regard to behavioral factors related to life styles and health, 26% of participants ate fruit, at least once a day, 82% slept around 8 hours, 80% usually did sport and 26% smoked. Note that a half of the sample were not worried at all about noise, 60% were very interested in local economic and political issues; meanwhile 54% were very concerned by global economic and political issues. Finally, data from the performed surveys are available from authors on reasonable request.

Table 1. Main characteristics of the survey participants in the economic experiment performed in the Public University of Navarre on June 7, 2014

Variable \ Cat.	N (participants) = 50			
Income level **%**	Less than 1,000€ 12%	1,000€ - 1,700€ 36%	€1,700 - €2,800 26%	More than €2,800 26%
Age **%**	18-24 52%		25-50 44%	Older than 50 4%
Occupation **%**	Student 60%	Unemployed 14%	Working 22%	Retired 4%
Level of studies **%**	Low or no studies 4%	Medium level 28%	University training 68%	
Gender **%**	Male 48%		Female 52%	

3.3. The survey sequence

The survey is compounded of two sessions: a first one devoted to noise evaluation and a second one devoted to air pollution assessment. Both sessions have the same structure and search to elicit hypothetical and real WTP from the survey respondents related to noise and air pollution respectively. The noise survey is organized in two questionnaires called H1 and R1 (see Appendix A), which ask questions about noise WTP from the hypothetical (without economic experiment implementation) and the real (with economic experiment implementation) points of view respectively. After the noise

survey (first session), an air pollution survey (second session) is built following the same methodological tenets than the noise one. Note that this paper pays the attention only to the noise survey. Within each session, there were three successive steps (Figure 2). In a first step, two non-profit organizations aiming at promoting environmental protection and actions to reduce health and environmental damages due to transport noise and emissions were asked to make a presentation highlighting their contributions to improve transport externalities. These organizations explained their goals and the actions they were currently making in order to face air and noise pollution problems. The first organization was a local one, mainly focused on the region of Navarre, Red NELS (Association of Local Authorities from Navarre for Sustainable Development (see http://www.pamplona.es/VerPagina.asp?idPag=14835EN&idioma=1), and the second one was Greenpeace, with a representative from the Navarrese section (see https://greenwire.greenpeace.org/spain/es-ES/#). The organizations selection was essential to the methodological design, because both have as a mission to help respondents to enhance their WTP to mitigate externalities. Furthermore, the choice of a local and a global organization searches to have a close commitment of the respondents with environmental issues.   Before the survey development, each association was clearly asked for their activities in order to fight noise and air pollution caused by transportation in Navarre. The presentations order was randomly chosen, and each presentation lasted exactly 20 minutes. This procedure ensures some equity between organizations when the survey respondents will be further required to contribute financially to one of those associations.

Figure 2. The noise survey sequence for each session
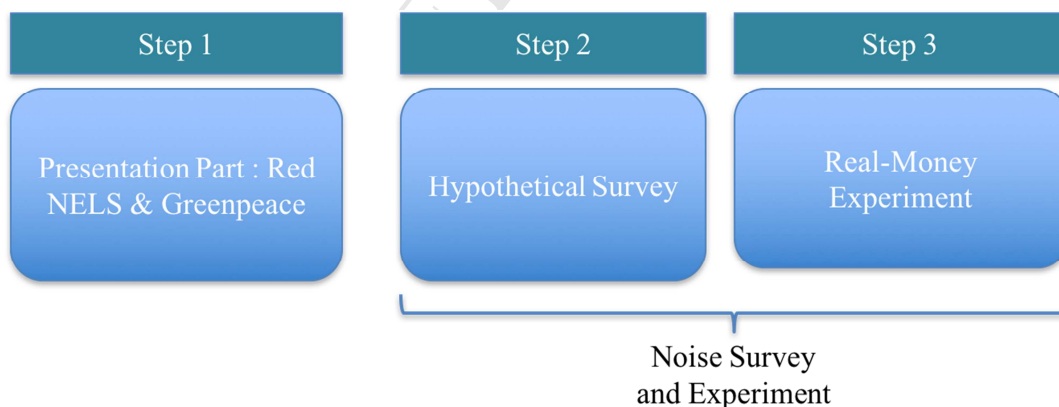
After this presentation step, the survey respondents were asked to answer the noise survey that includes two questionnaires H1 and R1 (hereafter steps 2 and 3, respectively): H1 presents a survey to elicit hypothetical values of WTP and R1 presents a real-money experiment (See Appendix A for further details). Actually, in the sense of Carson and Groves (2007), Part 2 is inconsequential whereas Part 3 is consequential. Figure 2 describes the noise survey sequence for each session.

During the hypothetical questionnaire H1, participants answered some questions related to noise issues and, particularly, the amount of money they would pay to reduce the noise damage in a certain

proportion (WTP). During the answer to R1 questionnaire, they were requested to state first, which organization they would choose to donate and after, the amount of money of their contribution. These amounts, either hypothetical or real incentivized, were chosen after respondents received specific information about the situation of the road transportation crossing the Pyrenees in Navarre and the traffic problems in Pamplona, along with their noise and environmental impacts.

In each incentivized part (having a real-money experiment), the same statement was proposed for each group member by implementing the group method explained in this paragraph. Thus, each participant in a 25 people-group was endowed with €60 (around US$66) from which the participant has complete availability. The estimation of this amount of €60was based on earlier studies made by Lera-Lopez et al. (2013, 2014) where respondents had three possible bid prices: €15, €30 and €45. This €60 endowment is designed to allow the respondents to pay the aforementioned amounts of money as a way to show their WTP. Nevertheless, it is clear that this budget constraint has also an important influence on the WTP the respondents would pay.

Moreover, the hypothetical surveys were performed using a traditional answer sheet with a pencil, while the real-money experiments were conducted through individual computers under the Z-Tree Platform (Fischbacher, 2007). At the end of each session, the associations were informed about the experiment results regarding the monetary contribution made by each group. Two sessions of 25 participants were run in a single day (7 June 2014) in the premises of the Public University of Navarre, in Pamplona (Spain).

3.4. The stated-preference valuation survey

In the noise survey first step, the participants were required to state a hypothetical WTP after being exposed to successive noise levels of 70 dB(A) and 50 dB(A). After having heard those types of noises, they had to provide their WTP for a noise reduction from 70 dB(A) to 50 dB(A). Similar questions were designed to measure the sensitivity of the participant to a particular damage, their ecological distress, their local and global concern, and their perception about the intensity of an environmental impact. Finally, other battery of questions was set to obtain information about individual traits of the survey respondents, such as gender, age, income level, social class, level of studies, car owning, self-report about health or sport doing, food, smoking and sleep habits, noise perception at home, or their knowledge about the non-profit organizations being present during the session. All these socio-economic characteristics were required in the questionnaire Q (see Appendix A).

3.5. The real-money experiment

3.5.1. The revelation mechanism: A Group Format Auction

In order to elicit WTP for noise pollution reduction in the incentivized section of the survey, a valuation experiment inspired by Horowitz et al. (1999) and Horowitz (2006; 2008) was run that builds upon a group presentation format. This format ensures a truthful revelation of individual willingness-to-pay. The experimental procedure is described as follows. In the group format, each participant belonging to a group of size N is enquired to state her/his WTP to obtain a certain level of reduction for a given damage; by indicating how much of a given endowment €E s/he would be ready to allocate to reducing damage actions.

All WTP statements were anonymous and simultaneously collected through a computer in a first round. In the second round, the revealed WTPs are ranked from the lowest value €b_i to the highest one, €B_i where $i=1,\ldots,N$. Then, let it be €x a random number uniformly generated between €b_i and €B_i. Therefore, the following rule is applied to settle individual payoffs. If more than 50% of the individual statements that lie between €b_i and €B_i are greater or equal to €x, then each group member gets privately €$(E-x)$ and, as a consequence, €Nx are allocated to environmental damage reduction. Conversely, if less than 50% of individual statements (comparison with the median bid) are greater or equal to €x, then each group member gets privately €E and nothing is allocated to environmental damage reduction. The Figure 3 explains the aforementioned auction mechanism.

This procedure frames a standard WTP experiment for a collective choice, as the experiment highlights, on one hand, the valuation exercise at the individual level of each participant, and, on the other hand, on a public choice decision, since the individual values are used to make a collective choice. Thus, this auction mechanism ensures full revelation of individual preferences. Other experimental procedures, frequently used for valuation, as for instance the Becker-De Groot-Marschak (BDM) methodology, (Becker et al., 1964) or the Second Price Vickrey's Auction (Vickrey, 1961) should also ensure this full revelation of preferences. Nevertheless, the Group Format compared to aforementioned procedures has the advantage of highlighting clearly the public choice dimension of the environmental valuation problem faced by individuals, due to the fact that noise pollution is a negative externality. Moreover, the median-value or median-voter approach, that was applied in this case, has some interesting properties, and it is incentive compatible under a broad range of conditions. It is not the case for BDM procedure or Vickers' Auction, as it was established by Horowitz (2006) and also empirically highlighted by Bohm (2008) for the BDM procedure.

Figure 3. The group format for auctioning on a public good

$$\tilde{x} \in \left[\min_i(b_i), \max_i(b_i) \right] \qquad \forall \ i=1,...,25 \qquad \text{bid}$$
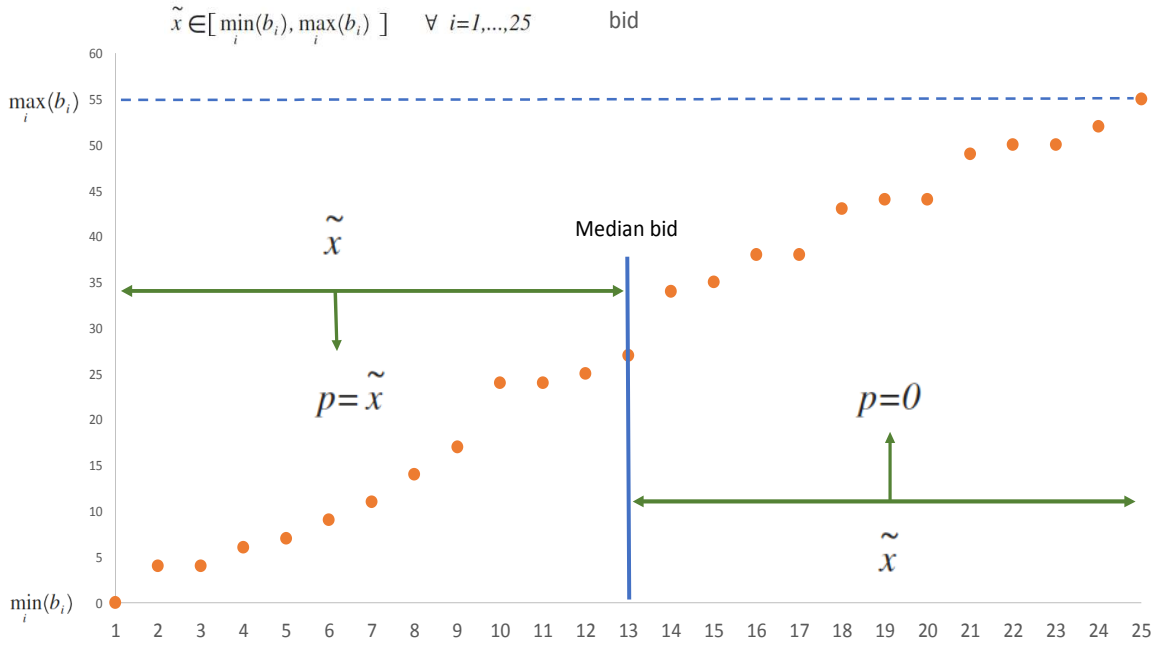
3.5.2. A numerical example describing the cost assignment process in the auction mechanism

The group format presented above and used in this survey is the same as the Random Price Voting Mechanism presented by Messer et al. (2010). A key characteristic of such mechanisms is that a purely self-interested individual has a weakly dominant strategy to bid her/his true value. Let us briefly illustrate why the group procedure is incentive-compatible with a simple numerical example.

Assume three risk-neutral bidders, each one denoted by i (i=1, 2, 3) that have home-grown values for noise reduction that are $WTP_1= €1, WTP_2= €0.5$ and $WTP_3= €0$, and that they should report a bid b_i for reducing noise. Note that individual values are normalized between €0 and €1 for simplicity, in the same way that probabilities lie also between 0 and 1. Let assume also that each bidder gets an endowment $Œ = €1$. According to the assumptions described in the previous paragraphs that if x, the random price for reducing environmental damage is higher than the median bid, no damage reduction is implemented whereas all bidders would pay €x if x is higher than the median bid.

Thus, let us assume €x to be uniformly distributed between the minimum value (€0) and the maximum value (€1). In the experiment, each bidder gets a payoff of € (WTP_i-x) if the public good is created (i.e., damage reduction is implemented) and €0 (zero) otherwise. Let us consider firstly the median bidder. If s/he reports her/his true bid (i.e., $b_2= €0.5$), her/his expected payoff is the probability of having an x lower or equal than 0.5 multiplied by the difference between her/his true value and the expected price of the public good, plus the probability of having x higher than 0.5 multiplied by zero (as bidders do not get any private value if the public good is not created). The expected price if $x \leq 0.5$ is, given the properties of uniform distribution, €0.25 and as a consequence the expected payoff for telling the truth is €E(π) = 0.5(€0.5 - €0.25) + 0.5(€0) = €0.125

Assume now that the median bidder underbids (e.g., reports b_2=€0.3 instead of €0.5). As the median bid equals now €0.3, the expected price conditional to the fact that x ≤ b_2 is (€0.3- €0)/2 = €0.15. Her/his expected payoff is therefore 0.3(€0.5-€0.15) + 0.7(€0) = €0.105, which is lower than the expected payoff of reporting the true value. If she overbids, e.g., reports a bid that is b_2=€0.7, then the expected price assuming x ≤ b_2 is now €0.7/2=€0.35. The expected payoff is now 0.7(€0.5-€0.35) + 0.3(€0) = €0.105, which is also less than when she tells the truth. That is, for the median bidder, the dominant strategy is to tell the truth.

Now, we are going to analyse the situation of the other bidders that are not median bidders. Basically, they have no incentives to bid above or under their true value since the outcome only depends on the median bid, and this median value is not affected by any deviation in their bid. Moreover, bidders do not know whether or not they are the minimum, maximum, or median ones. That is to say, the support of price expectations for them goes from 0 to endowment €E = €1. If non-median bidder reports her/his true value, his expected payoff would be 0.5(0.2-0.25) + 0.5(0) = -0.025. For instance, if bidder 3 reports €0.2 instead of zero, the probability of having x less or equal than 0.5 (which is the median value between 0 and 1) does not change, and therefore it is not possible to increase his expected payoff by overbidding. The expected payoff remains -0.025, since the non-median bidder does not know where the median bid is, and therefore should assume a median bid of 0.5. A similar argument can be used for underbidding, or for bidder 3. Non-median bidders are indifferent between telling the truth or lying where median bidder prefer to tell the truth. Consequently, truthful revelation by all bidders is a Bayesian Nash Equilibrium of this game, as shown by Messer et al. (2010).

4. The survey results

This section presents the results from analysing the surveys. It starts by describing the zero protest issue found in survey, and ends with the elicitation of WTPs and the hypothetical bias.

4.1. The zero-protest issue

Questionnaires play a crucial role in the correct application of CVM. Usually, CVM questionnaires have three main sections: an introduction to ensure the respondents have well understood the problem, the contingent valuation process itself, and finally, classifying questions about statistical characteristics of the respondent. Dealing with CVM surveys implies dealing with proportionally large amount of zero-response that should be treated adequately because some of them may be genuine ones and others may not.

Differentiation between a genuine zero WTP and a protest response is carried out by a set of questions located at the second section of the questionnaire (questionnaire H1, see Appendix A). There, some questions are placed to find out possible reasons for unwillingness to pay, that it to say, a willingness to pay that equals to zero. Based on the answers to these questions, researchers decide whether a zero WTP corresponds to a real economic valuation or whether they are protesting because there are

respondents that even valuing positively the proposed scenario, they are not willing to pay anything. Table 2 contents debriefing questions to detect zero-protest.

On the one hand, Q1, Q2, and, Q3 cover reals zeros since those are people that do not value, at least positively, economically the hypothetical proposed scenario. On the other hand, whenever respondents agree Q4 and/or Q5, even agreeing with at least one of the other three statements, they are protesting and their zeros become zero-protest.

Table 2. Questions to detect zero-protest (Q3 in questionnaire H1)

If WTP = 0	Reason for unwillingness to pay	Y/N
Q1	I am not aware of any traffic noise at home.	
Q2	I do not think my health is affected by traffic noise.	
Q3	I would pay more for more effective traffic noise abatement.	
Q4	The traffic noise is not my fault. People who cause the noise are the ones who should pay for it.	
Q5	The taxes I am paying already should cover that.	

When respondents do not say their genuine value, CVM may fail to elicit the correct economic value. Moreover, it is common that zero responses represent a high percentage of the answers. Generally, protesters arise in two ways: respondents who state a zero WTP although their true WTP is higher than zero (protest zeros) or those who say a very high amount that is much greater than their true WTP (Lindsey, 1994). However, the former occurs much often than the latter. Boyle (2003) gave three main reasons to understand why respondents do not express their genuine WTP: (*i*) some respondents simply may not understand what they are asked (*ii*) strategic answer: some people do not have to reveal their true preferences to prevent them from being taken into account to increase prices/taxes, and (*iii*) respondents may protest against the survey.

Protest zeros are often removed from the database (Andersson, 2007; Bateman et al., 2011). In this way, the bias caused by their inclusion is reduced. The drawback of this method is that potentially useful information is lost and would also include some selection bias. Thus, it would be assuming that the willingness to pay of this protest group would be the same as those who would not respond to the survey. In that case, zero-protesters are identified and included as a dummy variable in the statistical analysis.

4.2. The elicitation of WTPs and the hypothetical bias

The main purpose of the survey was the comparison individual responses that occurred in a hypothetical context to the responses that are given by the same participants in an incentivized context. Before performing the aforementioned study, it is found that the average WTP in a hypothetical

survey was between €24 and €27 per year and per person, depending on the considered sample (Table 3). These results are similar to those ones developed by Istamto et al. (2014a,b) who found values ranging between €20 to €30. Therefore, comparable outcomes are found in this research, even with small samples compared to larger studies.

Table 3. Basic statistics about WTP for noise reduction in our study (values given in euros)

	Full sample		Without zero protesters	
	WTP for noise reduction, Hypothetical	WTP for noise reduction, Real-Money	WTP for noise reduction, Hypothetical	WTP for noise reduction, Real-Money
Median	7.50	5.00	10.00	5.00
Mean	24.02	9.54	27.29	10.25
Standard Deviation	40.61	13.31	50.63	13.80
Observations #	50	50	44	44

Thus, considering the survey context, a strong bias for the average WTP was found, being more than twice higher in the hypothetical survey compared to the incentivized survey. Actually, when compute the Lden level for the punctual noise of 70 dB(A) during one minute, and then 50 dB(A) all over the day (by using www.ohcow.on.ca/uploads/Resource/noisecalculator.xls), it is obtained approximately 50 dB(A) Lden. It is interesting to note that the average (real) value of €9.5 here reported to reduce noise level from 70 to 50 dB(A) is connected to the damage cost for 51dB(A) Lden, given by European Commission (2014) for Spain (€8). Developing a t-test for the hypothetical WTPs, it results significantly different from real incentives ones (t=-2.02, p=0.0457) so both means are statistically different each other at any level of significance greater than 4.6%. If zero-protests are removed, the same conclusion arises, with stronger evidence: both means are statistically different from each other at any level greater than 3.6%. There is a huge dispersion of individual WTPs, as can be observed in Figure 4. Due to the fact that the real-money survey provides an endowment of €60 to participants, the distribution values are truncated in the top area. Therefore, the question is the relationship between the real-money WTPs and the hypothetical ones. It would be possible to conjecture that incentivized values have no relationship with stated ones, but they were only related to the given endowment to participants.

Figure 4. Distribution (Box Plot) of participants' WTP in the real-money and in the hypothetical surveys, having zero-protesters not included.
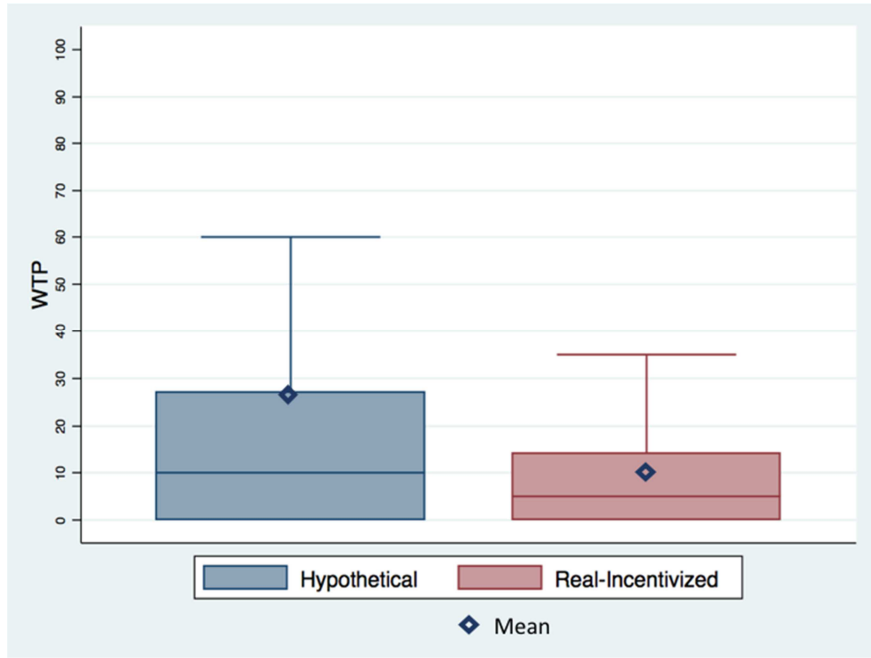
Additionally, there is a positive relationship between hypothetical stated values and real WTPs: the higher the hypothetical WTP is observed, the higher the real one is obtained (see Table 4). Regarding socio-economic variables, significant effects for some control variables have been obtained. Therefore, a Tobit regression was run in hypothetical WTP control variables to identify protesters (Table 5). In our research, we analyze the influence of some determinants on the amount the respondents are willing to pay. The problem is that in this type of questionnaire, respondents often give the answer 0 for WTP. If we ignore this fact, the results of the estimates will be biased and inconsistent because WTP values are truncated at 0, i.e. nobody can place a negative WTP. Therefore, we should censor somehow those zeros. The Tobit model provides the solution to this problem as follows:

$$WTP_i^* = \beta' \, x_i + u_i, i = 1,2,\dots n$$

$$WTP_i = \max(0, WTP_i^*), i = 1,2,\dots n$$

Where WTP_i^*, is the latent variable of the willingness to pay, WTP_i is the amount expressed by each of the respondents i, x_i the vector of independent variables, and u_i the error term. Econometrical analyses were made using the GRETL software (http://gretl.sourceforge.net/) due to its specific characteristics: it is free, easy-to-use, and efficient and powerful for the intended work in this paper.

Note that for the regressions validity, all necessary assumptions have been tested including the classical ones held in the Ordinary Least Squares (OLS) study in Table 4. With regard to Tobit models in Table 5 and Table 6, they have been estimated using robust standard errors for getting heteroscedasticity consistent estimations. Moreover, the test for normality of errors is available in Table 5. Nevertheless, the model displayed in Table 6 suffers from significant non-normal errors, mainly because of the few available observations. Note that the dependent

variable consists of the natural logarithm of a ratio, so many observations had to be removed in order to obtain results having mathematical meaning. Therefore, insights from Tobit in Table 6 should not be literally taken into consideration, but the signs of the independent variables are still valid. For further information about econometrical models, readers are referred to Wooldridge (2013).

Table 4. OLS, using observations 1-50
Dependent variable: Real-Money WTP
Heteroscedasticity-robust standard errors, variant HC1

	Coefficient	Std. Error	t-ratio	p-value	
Constant	7.159	1.872	3.82	0.0004	***
Hypothetical WTP	0.099	0.021	4.827	<0.0001	***

Mean dependent var	9.540	S.D. dependent var		13.314
Sum squared resid	7539.054	S.E. of regression		12.533
R-squared	0.132	Adjusted R-squared		0.114
F(1, 48)	23.299	P-value(F)		0.000014
Log-likelihood	−196.343	Akaike criterion		396.686
Schwarz criterion	400.509	Hannan-Quinn		398.142

Table 5. Tobit, using observations 1-50
Dependent variable: Hypothetical WTP for noise reduction
QML standard errors

	Coefficient	Std. Error	z	p-value	
Constant	−475.079	219.153	−2.168	0.0302	**
Health	6.971	13.664	0.510	0.6099	
AUDITION	43.238	28.920	1.495	0.1349	
SPORT	15.691	24.528	0.640	0.5224	
SLEEP	−28.559	20.357	−1.403	0.1606	
FRUIT	−6.353	32.714	−0.194	0.8460	
Car	27.661	25.780	1.073	0.2833	
Noise_Concern	20.953	8.588	2.440	0.0147	**
Student	88.383	40.225	2.197	0.0280	**
Low_Income	−74.255	28.175	−2.636	0.0084	***
Mid Low	4.230	23.264	0.182	0.8557	
Mid High	−65.424	23.734	−2.757	0.0058	***
Gender	20.582	20.459	1.006	0.3144	
Age	3.642	2.040	1.786	0.0742	*
Training	67.132	29.965	2.240	0.0251	**
Local sens	1.937	17.820	0.109	0.9134	
World sens	−8.340	18.440	−0.452	0.6511	
Ecol sens	67.170	25.435	2.641	0.0083	***
PRT	−443.781	130.79	−3.393	0.0007	***

Chi-square(18)	96.63001	p-value		9.14e-13
Log-likelihood	−158.0819	Akaike criterion		356.1638
Schwarz criterion	394.4043	Hannan-Quinn		370.7260

sigma = 55.3244 (17.1016)

Left-censored observations: 22
Right-censored observations: 0
Test for normality of residual -
 Null hypothesis: error is normally distributed
 Test statistic: Chi-square(2) = 34.4908
 with p-value = 3.239e-008

NB: 'Health' is the self-reported state of health, from 1 (excellent) to 5 (very bad), 'Audition' is a dummy equal to 1 in case of hearing problem, 'Sleep' is a dummy equal to 1 if the participant reported 7-8 hrs of sleep or more, 'Fruit' a dummy for consuming regularly fruits and vegetables, 'Car' is 1 for having a car, 'Noise Concern' is the self-reported index for noise annoyance (from 1, no worries, to 5, very worried), 'student' is a dummy, 'low income' is for income less than 1,000€ per month, mid-low for income between 1,000 and 1,700€ and mid-high for income between 1,700 and 2,800€. 'Gender' equals 1 for male, 'age' is self-reported age, 'training' is for the level of education (from 1 'basic' to 4 'university level'), 'local sens' is the self-reported sensitivity towards local economy and politics (from 1 not interested in, to 4 very interested), 'world sens' is the global sensitivity with the same scale as the previous one, 'ecol-sens' is a dummy equals to 1 in case of having an ecological sensitivity and 'PRT' is a dummy that take the value 1 in case of being a zero-protester.

Accordingly, the dummy variable identifying the protesters answers is PRT. The protesters WTP is significantly lesser than the non-protester ones (significant at the 1% level). Other statistical variable having a negative impact on the stated WTPs is the income level variable (discretized in the regression), as low-income participants report a significantly lower WTPs, but also intermediate income levels (income between €1700 and €2800) present the same situation. Conversely, the variables representing the variables of ecological sensitivity, noise concern, level of education (training), being a student, (and, to a less extent, age), have a positive impact on WTP levels.

In particular, evidence is discovered for noise concern and ecological sensitivity to increase (hypothetical) WTPs when the respondent is a student (60% of the sample). Hence, these results are habitual regarding socioeconomic determinants of WTP level to avoid nuisances as it was presented in the literature review section. Finally, the last important point is about the hypothetical bias and its determinants. According to the Harrison and Rutstrom's (2008) methodology, the natural logarithm of the ratio between the hypothetical WTP (WTP_H) and the real-money WTP (WTP_R) was considered as a measure regarding the intensity of this bias. Furthermore, the model was restrained to participants for which the hypothetical value is higher than the real one. Due to this restriction, many observations were removed (31 participants are dropped from the analysis). Thus, a Tobit regression was performed in the Table 6 to explain this ratio, where explanatory variables are the socioeconomic characteristics. Surprisingly, and even if the robustness of these results can be put into doubt, as previously stated, some interesting features are found.

In particular, the variables describing the following events: concern about noise level, owing a car, a higher level of diploma or to be a male, increases the discrepancy between hypothetical and real value. Age tends to reduce this discrepancy as well as having a local sensitivity.

Table 6. Tobit, using observations 1-50 (n = 19)
Missing or incomplete observations dropped: 31
Dependent variable: ln(WTP$_H$/WTP$_R$)
QML standard errors

	Coefficient	*Std. Error*	*z*	*p-value*	
Constant	13.979	9.699	1.441	0.14954	
Fruit	-0.980	0.998	-0.982	0.32630	
Car	2.952	1.319	2.238	0.02521	**
Noise concern	0.652	0.235	2.773	0.00555	***
Student	-2.702	1.520	-1.778	0.07547	*
Low income	-5.428	3.535	-1.535	0.12470	
Med. income	2.867	1.501	1.909	0.05622	*
Gender	1.714	0.678	2.528	0.01148	**
Age	-0.400	0.173	-2.319	0.02038	**
Training	1.814	0.694	2.615	0.00892	***
Local sens.	-2.287	0.760	-3.007	0.00264	***
World sens.	0.330	0.396	0.835	0.40391	
Ecol. Sens.	-6.934	4.291	-1.616	0.10609	

Chi-square(12)	331.8962	p-value	9.19e-64
Log-likelihood	-13.27395	Akaike criterion	54.54789
Schwarz criterion	67.77004	Hannan-Quinn	56.78560

sigma = 0.598312 (0.107655)
Left-censored observations: 6
Right-censored observations: 0

5. Discussion

Using the experimental economics methodology to estimate WTPs for noise abatement in Spain is the main contribution of this paper in relation to the literature. Furthermore, the first novelty of this work is the research of the hypothetical bias issue which, to the best of authors' knowledge, has never been investigated in the noise transportation area using a within-subject method. Moreover, the second novelty is the introduction of group dimension in the method for eliciting individual WTP for transport noise abatement.

Likewise, results clearly indicate the existence of hypothetical bias in the WTP estimation, even with a small number of observations. Additionally, the WTP levels are similar to previous studies implemented in the same Spanish regions (Lera -Lopez et al., 2014), providing a proof of the robustness of this study. Moreover, increasing hypothetical bias can be observed (i.e., higher hypothetical WTPs than real ones), depending on the statistic function used in Table 3, from 50% (comparison of medians) to more than 160% (comparison of means), which is in accordance with the literature related to the topic (Harrison and Rustrom, 2008; List and Gallet, 2001). Actually, List and Gallet (2001) report that Kenneth J. Arrow and Robert Solow (both Nobel Prize in Economics) recommended that hypothetical bids should be deflated using a 'divide by 2' rule, unless these bids can be calibrated using actual marked data. This rule is very close in its magnitude to what we

obtained as hypothetical bias in this work. Concerning the limitations of this study and its methodology, it is clear that some biases could have undermined the results. The first limitation of the current work would be a selection bias, because the survey participants knew beforehand they could have a monetary compensation for taking part in the survey. Therefore, the question which is raised here is whether or not the participants selected in this way can be considered as representative of the whole local population in Navarre. Moreover, as data are collected from one particular geographical area: 'the Navarrese Pyrenees' in Spain, results may not be valid for somewhere else'. To this respect, Abeler and Nosenzo (2015) address this issue implementing a laboratory experiment having participants of different origins: a first group recruited following the monetary reward; a second group appealed by the altruistic desire of helping research; and a third group recruited attracted by both arguments. These authors found that participants are mainly motivated by monetary rewards, but they did not find any significant differences between the three groups of participants in relation to their pro-social preferences, their risk preferences or their cognitive skills. The second limitation of this work is clearly the stake size bias, as it is possible to say that final amounts of WTPs are closely related to the endowment level assigned to each participant. There is a clear evidence indicating that the rise in stake sizes does not affect the role of pro-social preferences, in particular regarding bargaining games (Slonim and Roth, 1998; Cameron, 1999). A recent experimental study developed by Fehr et al. (2014) shows that, even in a very competitive environment, huge variations in stake size, from twice or three times the monthly income of participants to ten time of that amount, has influence neither on the magnitude of social awareness nor on individual effort behaviors. Therefore, this result supports the validity of the methodology here exposed. Finally, the last possible bias is related to the extrinsic incentives that are present in the experiment design, because those participants actually received some money as an endowment. Then, it could be stated that, giving a positive amount of money, in contrast to a non-reward situation, the participants would pay a higher WTP with higher probability. This assertion has not been confirmed by experimental evidence, because giving monetary incentives may crowd out intrinsic incentives to provide value to public goods or environmental issues. A discussion of these adverse effects of monetary extrinsic incentives is provided by Gneezy et al. (2011). They conclude that different kinds of incentives should be considered in the evaluation of the participants' response interaction. In the survey, there are partially monetary extrinsic incentives, but not non-monetary incentives, such as associations promoting their actions to keep a safe environment. Thus, such intrinsic motives were moderately control by means of a set of individual questions that try to elicit those motives and use them as explanatory variables. Consequently, after having contrasted the results and the methodology with the aforementioned references and literature, individual results obtained in this study may be considered really robust.

6.   Concluding comments

Apart from previous considerations this study contributes to the research literature measuring the traffic noise damage costs in several ways in a very specific context,. Firstly, the individual values that are obtained are close to the ones found in previous studies. Secondly, strong evidence for the existence of a hypothetical bias is obtained.

Moreover, this study is innovative with two main points, being the first one to propose an elicitation of traffic-related noise values for Spain, and also, being the first one to implement a group method to measure WTP instead of the traditional individual methods. It could be considered that the group dimension is a key methodology to measure traffic noise costs and, more generally, transport nuisances' costs, because they are related to public goods for which the collective concern is crucial. Besides, the second point of this study innovation is the definition of clear insights regarding economic values that could be used in order to quantify noise impact for transport infrastructure projects. These insights are particularly valuable when costs and benefits are compared, being relevant for helping public decision-making in the area of transport policy. In fact, from a practical point of view, it could be possible to design an environmental noise toll for the group of trucks crossing the aforementioned area of the Pyrenees in a specific period of time (usually one hour), valued on, at least, the mean of the WTP without zero-protests (€10.25) per affected person in that area, when the noise level was overcoming the 50 dB(A) threshold but below 70 dB(A). Other types of estimations could be done for other noise level intervals, designing a toll system in order to mitigate and control the noise impact of freight transportation.

Thus, concerning real WTP values, Arsenio et al (2006) used a stated-preferences survey in Lisbon, and found a WTP value for noise reduction per year and household being around €51.60. Even though a direct comparison between results is impossible, hypothetical WTP values for Spain obtained in this research halves the Arsenio's calculations and real values that are five times lesser. On the other hand, if comparing the results of this study with Martin et al. (2006) ones, which implemented the survey in Valladolid (Spain), similar values are obtained (€7.22 euros per person per year versus € 9.54 in this study). That comparison really enhances the validity of the results of this paper.

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Appendix A: Survey instructions (translated from Spanish, not to be published, available on website)

up**na**
Universidad
Pública de Navarra
Nafarroako
Unibertsitate Publikoa

ROAD TRAFFIC NOISE EVALUATION SURVEY-EXPERIMENT- June 2014

Instructions

Welcome to this survey-experiment. The study you are going to take part has the only purpose the academic research and its results will be published in scientific journals. Therefore, no commercial exploitation of results will be done. The answers you are going to give will be anonymous, which means that nobody, including the researchers, will be able to know who answered this questionnaire

A. Noise Analysis

(FOR ALL PARTICIPANTS)
Public University of Navarra has estimated the level of noise to which you are exposed living as you do in the vicinity of the AP-7/N-II/C-17/C-16/C-14 roads at 70 decibels, which is equivalent to the noise made by a heavy truck or a vacuum cleaner. This recording will give you an idea of how loud this is [**HIGH NOISE RECORDING**]

Q.1. Compared with the recording you have just heard, the level of noise you hear from your home is…

a. …much louder	1
b. …a bit louder	2
c. …the same / very similar	3
d. …a bit softer	4
e. … much softer	5

The Navarrese Government is considering measures such as the installation of acoustic panels for which they might ask all the citizens to pay a compulsory tax, similar to the one paid for garbage collection. Imagine that this measure would reduce the noise level from 70 to 50 decibels (like the noise made by a washing machine). You will now hear a brief recording of the current noise level followed by one of the reduced level **[COMBINED RECORDING - FRAGMENT OF HIGH NOISE LEVEL AND SHIFT TO A LOWER NOISE LEVEL]**

1) Noise Hypothetical treatment

Q.2. How much would you be willing to pay per year and household for a period of 5 years to achieve a **40%** reduction in the noise level affecting your home? Keep in mind that the money would be taken from your household budget, thereby limiting other payments.

Q.3. (if answer Q.2.=0) Given that you are unwilling to pay any sum at all, please indicate whether you agree (A) or disagree (D) with the following statements:

	A	D
a. I am not aware of any traffic noise at home	1	2
b. I cannot afford to pay because my income is too low	1	2
c. I do not think my health is affected by traffic noise	1	2
d. I would pay more for more effective traffic noise abatement	1	2
e. The traffic noise is not my fault. People who cause the noise are who should pay for it.	1	2
f. The taxes I am paying already should cover it	1	2
g. Other reasons (please specify) _____	1	2

ROAD TRAFFIC NOISE EVALUATION SURVEY-EXPERIMENT- June 2014

2) Noise real treatment

With regard to noise, the two experiment collaborative entities (Red NELS and GreenPeace) perform activities related to noise abatement that later have positive implications for the citizens of Navarra. For instance:

1) Red NELS supports local entities to the implementation of projects of Local Action Plans (Agendas Locales 21), many of them related to mitigation, control, and awareness of noise reduction.

2) GreenPeace participates in noise environmental importance awareness emitted by vehicles, making goods distribution companies to design protocols focused on noise abatement.

We will provide you 60 euros which you could invest part of them in fight against noise, giving us the authorization to transfer a portion of this amount to one of the associations you choose. You will keep the remaining money through a bank transfer. In addition, the sum to be eventually received by the chosen associations will be determined as follows:

a) You are located in a 25 participants group. Each of these participants will indicate through a computer how much money of 60 euros will allocate to one of the above associations (let us call this individual amount x, in euros).

b) Anonymously, we will collect the 25 payment proposals. Later, the computer will sort them from the lowest to the greatest amount. Let us call xMin the lowest proposal and xMax the greatest one. You will not know the money proposed by the other participants, just as the other participants will not know how much you propose.

c) The computer will select randomly a number between 0 and 60 euros. All values between 0 and 60 have the same probability. Let us call Y this random number.

d) If most of the x values proposed by participants are greater than Y (for example, in a 25 people group, if 13 propose an amount x greater than or equal to Y), then the association that had been chosen will receive the amount of 25*Y. At the end of the experiment, each participant will receive a individual amount of (60-Y) euros.

e) If most of the x values proposed by the participants are lower than Y, then the selected association does not receive any money and each participant will receive the amount of 60 euros.

An example would be useful here. Suppose that participant 1 proposes to pay 5 euros to one of the associations, that participant 2 proposes to pay 10 euros, (etc.) and the participant 25 proposes to pay 55 euros. In this situation, the minimum would be 5 and the maximum 55. The computer will choose a random number between 0 and 60 euros.

i.   Suppose the random number obtained is 25. If more than the 50% of the participants are willing to pay 25 euros or more, then the association would receive 25 * 25 euros = 625 euros. In this case, at the end, each participant would actually obtain 60 - 25 = 35 euros.

ii. Suppose the random number obtained is 35. If more than 50% of the participants choose to pay an amount lower than 35 euros, then the selected association would receive 0 euros and each participant would receive 60 -0 = 60 euros.

ROAD TRAFFIC NOISE EVALUATION SURVEY-EXPERIMENT- June 2014

C. Socioeconomic questionnaire:

Q.4. Did you know **GreenPeace** before this experiment?

a.	Yes	1
b.	No	2

Q.5. Did you know **Red NELS** before this experiment?

a.	Yes	1
b.	No	2

Q.6. How would rate your **health** over the last **12 months**?

a.	Excellent	1
b.	Good	2
c.	Satisfactory	3
d.	Poor	4
e.	Very poor	5

Q.7. Now, please answer YES or NO to following statements about your **lifestyle habits**.

		YES	NO
a.	I smoke	1	2
b.	I have or have had hearing problems	1	2
c.	I do sport or take a walk at least 3 times as week	1	2
d.	I sleep between 7 and 8 hours a day	1	2
e.	I eat 4 or 5 pieces of fruit and/or vegetables every day	1	2
f.	I use a car for most trips	1	2

Q.8. Using the following scale, would you please indicate your degree of **concern** regarding the level of **noise** in the area where you live?

a. Not at all concerned	1
b. Slightly concerned	2
c. Moderately concerned	3
d. Very concerned	4
e. Extremely concerned	5

Q.9. Using the following scale, would you please indicate your degree of **concern** regarding the level of **air pollution** in the area where you live?

a. Not at all concerned	1
b. Slightly concerned	2
c. Moderately concerned	3
d. Very concerned	4
e. Extremely concerned	5

Q.10. How many people from each of the following groups **make up your household**?

a. Children (up to 10 years of age)
b. Adolescents (11 to 18 years of age)
c. Adults
d. Pensioners

Q.11. Are you a full-time student?

Q.12. What is your job? (Answer jointly with question 15)

Q.13. What is the current job of the main earner in your household? (Retired people, please state previous job, widows/widowers please state job of the deceased person).

Self-employed:	Q.14	Q.15
Self-employed in business, retail, or industry	1	1
Crop farmer, Livestock farmer………………….	2	2
Liberal professional……………………………...	3	3
Self-employed tradesman………………………	4	4
Employee:		
Director, Manager……………………………..	5	5
High-level tenured post, High level technician	6	6
High-ranking civil servant…………………….	7	7
Middle-ranking civil servant…………………...	8	8
Mid-level tenured post, Middle manager………	9	9
Commercial agent / representative…………….	10	10
Non-degree civil service post…………………..	11	11
Administrative worker, Office clerk.. ………….	12	12
Salesperson, retail sales assistant....... ………….	13	13
Skilled worker……………………………………	14	14

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Unskilled worker, Labourer……………………..	15	15
Apprentice, Junior………………………………..	16	16
No occupation:		
Unemployed……………………………………….	17	17
Student………………………………………………	18	-
Retired / Pensioner………………………………	19	-
Homeworker………………………………………	20	-

Q.14. Now, taking into account all current sources, where would you say your total average monthly **household income** falls on the following scale?

a. More than 4.000 euros
b. Levels in between (Go to **Q.15**)
c. Less than 1000 euros

Q.15. More specifically, how would you estimate your **household income** on the following scale?

a. 2.801 to 4.000 euros per month
b. 1.701 euros to 2.800 euros per month
c. 1001 euros to 1.700 euros per month
d. Do not know / No answer

Q.16. If you have chosen not to answer questions 16 and 17, are you willing to indicate which **social class** you belong to?

Upper	
Upper-middle	
Middle-middle	
Lower-middle	
Lower	

Q.17. Do you mind telling us your **gender**?

a. Male | 1 |
b. Female | 2 |

Q.18. Do you mind telling us your **age**?

Q.19. And your **education** level?

a. None/primary | 1 |
b. Lower secondary | 2 |
c. Upper secondary or vocational | 3 |

d. University   `4`

e. Other (please specify)   `5`

     _____

Q.20. What is your sensitivity to **local** economic and political issues?

a. Not interested at all   `1`

b. A little interested   `2`

c. Something interested   `3`

d. Very interested   `4`

e. I do not know   `5`

Q.21. What is your sensitivity to **global** economic and political issues?

a. Not interested at all   `1`

b. A little interested   `2`

c. Something interested   `3`

d. Very interested   `4`

e. I do not know   `5`

Q.22. Do you consider yourself sensitive to **ecological issues**?

a. Yes   `1`

b. No   `2`

c. I do not know   `3`

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Managing Transportation Externalities in the Pyrenees Region: Measuring the Willingness-To-Pay for Road Freight Noise Reduction using an Experimental Auction Mechanism

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Highlights

- A Contingent Valuation Analysis and an economic experimental auction were conducted in Navarre (Spain) developing a suitable survey for willingness-to-pay (WTP) to avoid noise pollution due to transport.

- We have measured the hypothetical bias for traffic noise WTP.

- We infer that hypothetical WTP for noise reduction is more than twice the real WTP.

- We have identified some key socio-demographic variables for hypothetical bias.