Methodological issues in eliciting people's preferences for Norwegian climate forest planting

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Abstract

This thesis is based upon two surveys conducted by the Norstat panel and the Norwegian Citizen panel during the spring of 2020. The surveys aimed to elicit the respondents willingness to pay (WTP) for afforestation on former pastureland on the west coast and northern parts of Norway. The surveys were constructed in a way that allows for extensive research on methodological issues associated with the contingent valuation method (CVM). This dissertation investigates two of these methodological issues. The first issue is related to whether differences in the formulation of WTP questions can cause hypothetical bias in CV surveys. The second issue is related to whether underlying motivations when controlling for socioeconomic characteristics, can cause significant differences in the elicited WTP between different survey panels. Using a Welch's t-test, the thesis investigates the differences between two different script treatments. The Welch's t-test is further used to compare the WTP between the two survey panels. The tobit model is used to control for socioeconomic assemblage of the respondents between the surveys to examine whether underlying motivations are factors that researchers need to consider when conducting CV studies. The findings in this thesis suggest that adopting an alternative script including a "cheap talk" formulation might mitigate demand effects. Furthermore, the research indicates that there are no significant differences in mean total WTP between the two survey panels in question. The tobit regressions resulted in significant results for several explanatory variables associated with underlying motivations. This supports the "citizen versus consumer" hypothesis, indicating that there are differences in altrusitic motivations for respondents in survey panels. This might be important factors that researchers should take into consideration when conducting CV studies. Controlling for this could contribute to increasing the accuracy of nonmarket valuations.

Preface

This dissertation marks the end of my years as a student at the Department of Economics. The study of economics has been challenging, but also interesting and rewarding.

Econometric calculations were conducted using the statistical software Stata.

Any mistakes or errors in this thesis are entirely my responsibility.

Content

List of tables

List of figures

Acronyms

CFP= Climate Forest Program

ES= Ecosystem Service

CBA= Cost Benefit Analysis

SP= Stated Preference

CVM= Contingent Valuation Method

WTP= Willingness To Pay

WTA= Willingness To Accept

SSB= Statistisk Sentralbyrå (Statistics Norway)

RP= Revealed Preference

CE= Discrete Choice Experiment

IMC= Screeners or Instructional Manipulation Check

1. Introduction

Norway has committed to cutting greenhouse gas emissions by 50 to 55 percent by 2030 (Regjeringen, 2021). The Norwegian government is currently considering a Climate Forest Programme (CFP), which will focus on climate forest afforestation on former pastures as a way to sequester carbon from the atmosphere. Compared to natural reforestation, climate forests are more effective at carbon sequestration (Iversen, Lindhjem, Jacobsen, & Grimsrud, 2021) because the climate forest is densely planted and grows faster. In addition, it could contribute to the substitution of carbon-intensive materials with biomass (Iversen et al., 2021). However, there are disadvantages with climate forest planting related to loss of biodiversity and deterioration of cultural heritage, and cultural landscapes (Miljødirektoratet, 2013). If the abandoned pastures are left unmaintained, they will grow into natural forests. The natural forests and especially pastures are better at preserving biodiversity than climate forest (Miljødirektoratet 2013), but not as effective regarding sequestration of greenhouse gases (Iversen et al., 2021).

In the discussion on whether to implement a CFP, it is beneficial to conduct a cost-benefit-analysis (CBA), weighing the advantages and disadvantages against each other. However, there are difficulties with stating a market price for environmental goods and services as they are typically not directly sold in the market (Champ, Boyle, & Brown, 2017). A way to solve nonmarket valuation is to use stated preference methods (SP) to value environmental goods by issuing surveys to those potentially affected. The Contingent Valuation Method (CVM) is one of these survey-based SP methods, asking for consumers' willingness to pay (WTP) or accept (WTA) for the protection of environmental goods. By taking an aggregate of the stated amount reported by the participants of the survey, it is possible to provide a monetary value for protection of specific environmental goods (Champ et al., 2017).

The idea of valuing an environmental good in monetary terms has been controversial (Kahneman & Knetsch, 1992). There are several disadvantages with surveys in general and nonmarket valuation specifically. Although the field has been explored thoroughly over the years, there are methodological issues related to the reliable elicitation of the value of the environmental goods. Although controversial, economists agree that the CVM is a good source of providing information about the value of nonmarket goods such as environmental goods (Kling, Phaneuf, & Zhao, 2012). This kind of analysis could serve as an important component in a CBA (Blamey, Common, & Quiggin, 1995).

The Norwegian Citizen Panel and the Norstat panel, in collaboration with Menon Economics and Statistics Norway (SSB) issued two CV studies during the spring of 2020, in order to elicit the Norwegian population's WTP for afforestation of climate forest. The purpose of the surveys was to study the WTP for these environmental measures. These types of SP-studies could potentially become important as a part of the assessment for the Norwegian government in order to determine whether the measures should be implemented. The purpose of the surveys was also to examine potential methodological challenges important for CVM's. Two issues were given specific attention. The first was related to differences in the respondent samples between the two internet survey panels. A potential issue could arise if the respondents had different underlying motivations to contribute to surveys. This could materialize as significantly different reported WTP's on average, based on which panel the respondents were members of. By adding the same questions to two different surveys, researchers could decide if WTP answers contained significant differences when controlling for socioeconomic dissimilarities between the respondents in the two panels. Another potential issue is related to hypothetical bias in stated preference (SP) methods. By adding an alternative treatment script and a standard script as a control into both of the similar surveys, fruitful research on whether script treatment could potentially avoid so-called "social desirability bias" could be conducted.

This master thesis will especially seek to examine these two methodological issues. In this thesis, I will investigate 1) if there are any significant differences with respect to the WTP for afforestation when comparing the standard script and the alternative script presented in both of the two surveys and 2) if there are significant differences for WTP for afforestation between the survey panels and if so, if there are underlying motivations that could explain these differences when controlling for socioeconomic characteristics.

The issues are compelling for two reasons. It can serve as an interesting contribution to the much-discussed methodological issues in nonmarket valuation. Furthermore, the research on which this thesis is based upon could contribute to gaining valuable insight into whether the afforestation of climate forests should be one of several means to achieve Norway's climate commitments.

The thesis is structured as follows: Chapter 2 introduces the theory and literature behind nonmarket valuation. Chapter 3 provides insight into how the two surveys referred to in this thesis were designed and conducted. Chapter 4 presents the data and the econometric approach to the research questions. By using the statistical software Stata, I will provide an

analysis of the research questions in chapter 5. Finally, I will discuss and conclude in chapter 6.

2. Theory and literature

The thesis consists of two main questions regarding methodological issues concerned with nonmarket valuation and stated preferences. The first issue relates to the importance of how the WTP questions are formulated. The second issue relates to whether underlying motivations could influence respondents answers in contingent valuation (CV) studies. As this thesis is based on CV studies for planting climate forests, it is necessary with a clarification on the forestation-term. Forestation is the process of restoring damaged forest or growing forest on areas that have not currently consisted of forest. This definition includes the term afforestation, meaning planting on areas without previous forest (Institute for Carbon Removal Law and Policy, 2020). The areas that have been evaluated for planting climate forests in the studies relevant to this thesis are former pastureland. These areas have been used as pastures for centuries. They are therefore considered as areas that has not previously consisted of forests. The term afforestation will therefore be used consistently in this thesis.

2.1 Theoretical concepts

In order to carry out empirical analyses in the following parts, it is necessary with a discussion on the relevant theories consistent with this dissertation.

2.1.1 Nonmarket valuation

Environmental goods can be described as nonmarket goods, as they are not fully captured by purchases or sales in a market (Champ et al., 2017). These publicly provided goods are typically non-rival and non-exclusive. Non-rival means that several individuals can enjoy the good simultaneously. One person's use does not exclude someone else's. Non-exclusive means that it is not possible to exclude someone from using the good. The latter is what leads to market failures for publicly provided goods (Phaneuf & Requate, 2017). These types of goods are not commonly traded in the market and can therefore be a victim to market failure as there typically is no market price for such goods. The goods tend to be undervalued and therefore underprovided from a society's perspective (Champ et al., 2017). Environmental goods share characteristics of public goods, and the use of these goods tends to lead to overuse. Environmental goods are therefore victim to negative externalities (Phaneuf & Requate, 2017). The necessity and wish for developing a method of eliciting the market price for protection of environmental goods has led to increasing research on so-called revealed

preference (RP) and stated preference (SP) methods. In the following, these valuation methods will be discussed. A particular focus will be given to the SP method given its importance for this thesis.

The RP method tries to compensate for the missing direct observable value of environmental goods by instead observing consumers behaviour in a related market with an existing market value (Phaneuf & Requate, 2017). Assuming individuals behave rational, their choices will be based on the preferred outcome for the individual. In an environmental perspective, the method tries to capture the use value for individuals' preferred environmental choice (like visiting a recreational park), and then find the value for the good indirectly from this (the price for visiting the park) (Champ et al., 2017). This method relies on observed data and can thus only elicit the direct use value of the environmental good.

2.1.2 Stated preferences

In contrast, the stated preference valuation methods estimate values by asking individuals through surveys about their preferences, and by doing this, extracts the values from the respondents. This method requires surveys with hypothetical questions developed to help elicit the need or wish for an environmental good. Unlike the revealed preference approach, the stated preference approach can define both the use- and passive-use values (Champ et al., 2017). There is a spatial element in this definition where use-values are understood as values where the individual is directly influenced, while passive-use values are understood as values where the individual is not directly influenced by the environmental good (Arrow et al., 1993). In our case, the consumers living on the west coast of Norway can be understood as use-value individuals in relation to afforestation of climate forest in the western parts. For the latter, inhabitants of Oslo are passive users of the environmental means.

Two approaches can be taken in order to derive stated preferences related to the valuation of nonmarket goods. Contingent Valuation Method (CVM) and Discrete Choice Experiment (CE). The CE method asks respondents to indicate their preference among several alternatives (Johnston et al., 2017). Each option is described by a number of attributes. The method thus asks the respondent to compare their preferences for different ES, often by answering multiple-choice questions (Phaneuf & Requate, 2017). However, more relevant for this thesis is the CVM.

The CVM is one of the most widely used techniques to elicit welfare effects for the protection of ES. The purpose of this method is to elicit each individual's personal valuation of the

public good (Blamey et al., 1995). Individuals are asked if they would vote for a proposed change (for instance a change in an ES) at a specified cost (Johnston et al., 2017). The proposed change is often expressed in monetary terms, asking the respondents how much they are willing to pay (WTP) or willing to accept (WTA) for this change. This way of translating nonmarket goods to monetary values is beneficial as it makes it easier to aggregate the nonmarket values and compare them to the costs, which thus can serve as an important component in a cost benefit analysis (CBA) (Champ et al., 2017). The WTA is associated with a negative change, asking the respondent how much he would need in monetary values to accept a negative outcome (Hausman, 2012). The WTP asks the respondent to state how much they would be willing to pay for a good or for the protection of the good, that the individual currently does not possess (Carson & Hanemann, 2005).

To get a better understanding of the economic concept of WTP, the following section, largely following Carson & Hanemann (2005) and Phaneuf & Requate (2017), will provide the basic environmental economics of welfare theory. Consider an individual with an indirect utility function $v(p, q, y)$ where p is the vector of the market prices for commodities, q is the environmental item being valued, and y is the individuals exogenous income level. The environmental good being valued can be interpreted as a change in q. A change from q^0 to q^1 will lead to an increase in the individuals' utility function. The individuals' valuation of the environmental good therefore depends on his appreciation of the good, q but also the price of commodities, p and his income level, y.

The value of the individuals change in monetary terms is represented by the two measures below, depending on if the CVM is measured in WTP or WTA for the individual:

$$v(p, q^1, y - WTP) = v(p, q^0, y)$$

and equivalent variant WTA which satisfies

$$v(p, q^1, y) = v(p, q^0, y + WTA)$$

The WTP and the WTA represents the individuals' maximum threshold to secure the provision of the good. Thus, WTP and WTA > 0 is considered as an improvement.

By using this general framework, it is possible to aggregate the mean of individuals' positive WTP or WTA. For policy makers this could serve as part of a process to determine whether a change in an environmental good should be conducted.

Given that the Norstat- and the Citizen Panel conducted CV surveys asking for the respondents WTP for afforestation, the following will focus on this method. This method is also in line with best practices recommended by the NOAA-panel (Arrow et al., 1993). There are several ways the WTP elicitation can be mapped. The response format can include open-ended questions, where the respondent is asked for their maximum WTP for a proposed change (Champ et al., 2017). Furthermore, the respondent can be introduced to a payment card-strategy, where the respondent is shown a card containing a range of monetary values and is asked to adjust their WTP within the limits of this card. Finally, we have the dichotomous choice format and double-bounded dichotomous choice format, where the respondents are asked a simple binary yes/no question. The latter format contains a follow-up question on the binary scheme (Phaneuf & Requate, 2017). Whatever payment strategy is chosen, for a thorough CV analysis it is important to present the hypothetical scenario to respondents in a way that is clearly understood. Furthermore, it is important that the questions formulated, and the described changes, are clearly understood, so that the utility consequences for the respondents are clear (Johnston et al., 2017). This way, the stated WTP could be more precise and representative. It is important that the respondents really believe that their answers matter for the good in question. Furthermore, the phrasing of the WTP question is an important part of CVM, as it may influence how the respondents react to the questions. The way the questions are formulated might affect hypothetical bias, a common critic against nonmarket valuation (Hausman, 2012). Hypothetical bias might occur because people tend to differ in regard to what they say and what they really mean (Hausman, 2012). Therefore, there are concerns that SP surveys tend to overestimate the WTP (Johnston et al., 2017).

The WTP questioning format may differ depending on the chosen approach. The surveys relevant for this thesis applied a payment card format. For this approach, there are typically two different ways of phrasing the WTP question (Strand, 2007). It could be phrased in a similar way as this:

1. "What are you willing to pay individually, for an increase in the quantity of an environmental good?"

Or:

2. "What are you willing to pay, on behalf of your household, for an increase in the quantity of an environmental good?"

The bid design in the WTP part of the surveys is especially important. Whether the payments are mandatory or voluntary, the frequency of the payments and who is paying (individual or on behalf of the household) is vital to pinpoint (Johnston et al., 2017). Lindhjem and Navrud (2009) find that using individual WTP may overestimate aggregate WTP. They suggest that using a household WTP is more accurate. The current surveys also use household WTP. In addition to this, the surveys also ask what the respondents believe the *society* should pay for afforestation.

2.1.3 Demand effects, script treatment and "cheap talk"

A common critique about CVM is that the responders might help to confirm a researcher's hypothesis (Mummolo & Peterson, 2019). These so-called demand effects could happen if the WTP questions are formulated in a way that might lead the respondent to not answer truthfully. The demand effects could be anything that may influence the respondent's behaviour in the survey (Carlsson, Kataria, & Lampi, 2018). How the questions are phrased are important in order to avoid these kinds of hypothetical bias. Literature seeking to find a best practice solution to the framing of survey questions are divergent. Johnson et al. (2017) suggests that the questions are presented precise and objective, and Hanemann (1994) emphasizes the importance of the questions being presented in a neutral and balanced way, to avoid framing effects. This might be especially challenging in SP studies where the valuation of environmental goods is studied.

Carlsson et al. (2018) state two important reasons related to why it is difficult to implement neutral surveys for ecosystem services (ES). The first is that environmental studies demand some sort of trade-off between humans and the environment. The second is the fact that CV surveys tend to focus on one ES only, which could indicate its significance to the respondents.

Carlsson et al. (2018) claim that demand effects in stated preference (SP) studies are understudied. In their paper "Demand effects in stated preference surveys", they conducted a discrete choice experiment (CE) study in order to elicit the Swedish population's WTP for improved water quality. They introduce three different scripts presented to the respondents, in order to check whether formulations in SP surveys affects the respondents' answers. The first script, the control script, was formulated as a standard CE question, containing information about the water quality in Sweden, before asking the respondents to choose between three alternatives, eliciting to what extent they wanted the water quality to remain the same, improved, or even more improved. The three alternatives would have a cost ranking from 0 SEK (Swedish Krone), 100 SEK, and 350 SEK, respectively. The second script was

formulated the same way but contained additional information about Sweden's environmental quality objectives. The final script was identical, however containing the following additional text:

> "*Why is your opinion important? In this survey it is important that you consider what you think about water quality in Sweden and in your county. You should also consider if you are willing to pay for improvements and if so how much. Water quality is one of many environmental quality objectives in Sweden. Remember we want your opinion, not the experts'. So don't answer what you think we or other experts think one should do, instead we want to know what you think. There is no right or wrong answer, as long as you answer what you think. Ask yourself this: Do I think water quality is good as it is today, or do I think we should invest in actions to improve water quality. It is only you that can answer the question about your views given the information you have received.*" (Carlsson et al., 2018, p. 297).

The purpose of this alternative script containing a "cheap talk" was to assess if demand effects might be mitigated by elucidating to the respondents the importance of answering truthfully. The study finds that demand effect bias can be reduced by including such scripts (Carlsson et al., 2018). A related study is the research done by Mummolo and Peterson (2018). They compare the effect of providing the respondents with the experimenter's purpose and wish for the study, with the effect of keeping it secret in order to avoid demand effects of respondents answering what they believe is the researcher's desired outcome. They find that there are no significant differences between revealing the purpose of the experiment compared to keeping it secret (Mummolo & Peterson, 2019). A third study finds that "cheap talk"-effects might nudge the consumers to state a higher WTP than their true value (Petrolia, Penn, Quainoo, Caffey, & Fannin, 2019).

Inspired by the study done by Carlsson and others in 2018, the surveys in this thesis included an alternative script treatment, with the purpose of examining demand effects. This will be discussed thoroughly in chapters 3 and 4.

2.2 Systematic differences in WTP between survey panels
The second part of this thesis seeks to examine whether there are significant differences in the stated WTP for afforestation between the two survey panels. If there is, it is interesting to examine whether these differences could arise from the respondents underlying motivations, when controlling for socioeconomic assemblage. One of the survey panels in this thesis, the

Citizen panel, is run by social scientists from the University of Bergen. The surveys they provide are for scientific purposes on questions related to social science (Universitetet i Bergen, n.d.). The other survey panel, the Norstat panel, provides in addition to relevant data for scientific purposes also data for marketing purposes (Norstat, n.d.). An interesting approach to the upcoming analyses is to assess if differences in between the panels are due to the fact that members of one of the survey panels are more engaged in the society than the members of the other panel. In other words, do the survey members in the two panels respond as selfish consumers or as altruistic citizens?

In order to describe the survey design and to carry out an analysis in the following parts, it is necessary to go through some of the existing literature on the hypothesis about citizen versus consumer-responses in CV surveys.

2.2.1 "The Citizen versus Consumer" hypothesis

A vital future of SP studies is that the respondents answer their true WTP, in order to elicit the aggregated respondents' preferences for the environmental good in question. If not, the answers could be biased, and it would not be beneficial as part of a cost-benefit analysis (Blamey et al., 1995). Sagoff (1988) argues that the SP literature fails to distinguish between the individuals' role as a consumer and a citizen. Extensive literature has since then tried to provide insight into the issue. Political attitudes and socioeconomic background could correlate with behaviour, leading to a stated WTP higher than if the consumers only considered their true WTP (Ajzen, 1996). Many CV surveys use public policy instruments such as taxes as a payment vehicle. According to Blamey et al. (1995), this might encourage the survey participants to express ethical and political "citizen" values as opposed to "consumer" preferences, leading the CVM towards a political choice rather than a market setting. The issues related to this have manifested into the discrepancy between the respondent's answering surveys as a "consumer", a *Homo Economicus* seeking to maximize their own utility, and respondents answering as a "citizen", a *Homo Politicus*, which is an individual seeking to maximize the welfare of the society (Nyborg, 2000).

The literature has shown evidence that some respondents in SP studies state their WTP for altruistic reasons while others have selfish reasons. In a study of forest management in Australia, Blamey et al. (1995) find that respondents in SP studies act primarily as "citizens". Another study find that individuals express a higher WTP for improved food safety standards in restaurants when acting as "voting citizens" rather than as "buying consumers" (Alphonce, Alfnes, & Sharma, 2014). On the other hand, Curtis and McConnell (2002) provide evidence

that there are no differences between those who proclaim a "citizen perspective" with altruistic preferences and the other respondents indicating entirely private preferences.

The differences have highlighted the importance of taking these embedding effects into consideration when conducting CV studies (Kahneman & Knetsch, 1992). Liebe, Preisendörfer and Meyerhoff (2011) highlight that moral concerns and altruistic motivations should serve as part of a CV study, in addition to standard economic models.

In the empirical part of this thesis, I will compare the mean total WTP stated by the respondents for the two surveys, the Citizen panel and the Norstat panel. By doing this, I wish to examine whether there are significant differences between the survey panel respondents in terms of underlying motivations. I will control for this by adding several socio-economic variables in the analysis. Whether there are significant differences, it is interesting to observe what characteristics that differ between the respondents in the two survey-panels. In order to conduct an empirical analysis on this, it is necessary to describe the survey design in chapter 3 before providing descriptive information about the respondents and the different variables used in chapter 4.

3. Survey design

This thesis seeks to assess the differences in two separate contingent valuation (CV) studies conducted to the Norwegian population during the spring of 2020. Menon Economics and Statistics Norway (SSB) added the questions relevant for this thesis into the surveys. The surveys are different regarding the number of participants and the amount of questions asked to the respondents. However, the questions supplied by Menon and SSB are nearly identical in the two surveys. The surveys were constructed following best-practice procedure for CVM (Arrow et al., 1993). The first part contained general questions like age, residential area, sex, and political preference. The surveys then went on to the part about climate and afforestation.

The following section will describe the two surveys.

3.1 The Norstat panel

The Norstat panel is run by Norstat, which is the leading European data collector for market analysis (Norstat, n.d). The panel consists of randomly selected people who has agreed to participate in surveys on everything from new products to politics. To secure a high quality and representative distribution, appropriate candidates are invited to register as members of the panel. The participants are invited to many surveys annually, mostly surveys related to

consumer-goods and other commercial purposes. To reduce the risk of "respondent fatigue" the panel restricts each respondent's participation to no more than two surveys per month (Norstat, 2019) . As a compensation for their time, the respondents receive "Norstat-coins" they can exchange in gift cards or give away to charity (Norstat, n.d). Responders receive approximately 1 NOK per minute they spend on the survey. The surveys are conducted as online surveys, which is in line with today's development in the enhancement of internet-based surveys (Johnston et al., 2017).

The survey began by asking the respondents general questions like age, zip code, sex, and political preference. The survey then went on to the part about WTP for afforestation.

3.2 The Norwegian Citizen Panel ("Medborgerpanelet")

The Norwegian Citizen panel is run by the Digital Social Science Core Facility, associated with the Faculty of Social Science at the University of Bergen. The survey panel is designed for research-related purposes on social and political topics. The survey panel is less commercial oriented than the Norstat panel (Ivarsflaten et al., 2021). The survey panel currently consists of over 10000 active participants and represent a probability sample of the Norwegian population aged over 18 years. The members have been recruited by post in different waves and are currently recruited annually. The survey panel carries out online surveys three times a year. Each survey lasts for about 15 minutes. For every survey conducted, three gift cards valued 8000 NOK are rewarded randomly to the respondents as an incentive (UiB, 2022).

The questions related to this thesis was included in one of the Citizen panel surveys during the spring of 2020. Since the surveys in this panel are distributed less often than the Norstat-panel, the survey also included many other questions for the respondents to answer. However, the questions related to afforestation of climate forest was added early in the survey, to help secure that the respondents were focused and not influenced by preceding questions. Besides some basic introduction questions and socioeconomic questions at the beginning of the survey, the afforestation-related questions were identical to the questions in the Norstat panel.

3.3 WTP elicitation

As the WTP part is crucial in this thesis, it is necessary with a particular focus on this in the following. After the basic introduction questions, the respondents in both survey panels were asked how negative or positive they believed the consequences of climate change in Norway would be. The surveys then informed the respondents about the advantages and disadvantages

related to planting climate forest. The respondents were presented with pictures of the different scenarios regarding planting climate forest with Norwegian spruce or letting the pastures grow into natural forests[1].

Figure 1) Presentation of environmental good

Many of the planted areas grow back and will eventually turn into mixed forest. With afforestation, these areas will instead be covered by Norwegian spruce. Two examples of what a landscape will look like after 85 years of natural overgrowth and with planted spruce are shown below.

Natural reforestation   Afforestation with Norwegian spruce
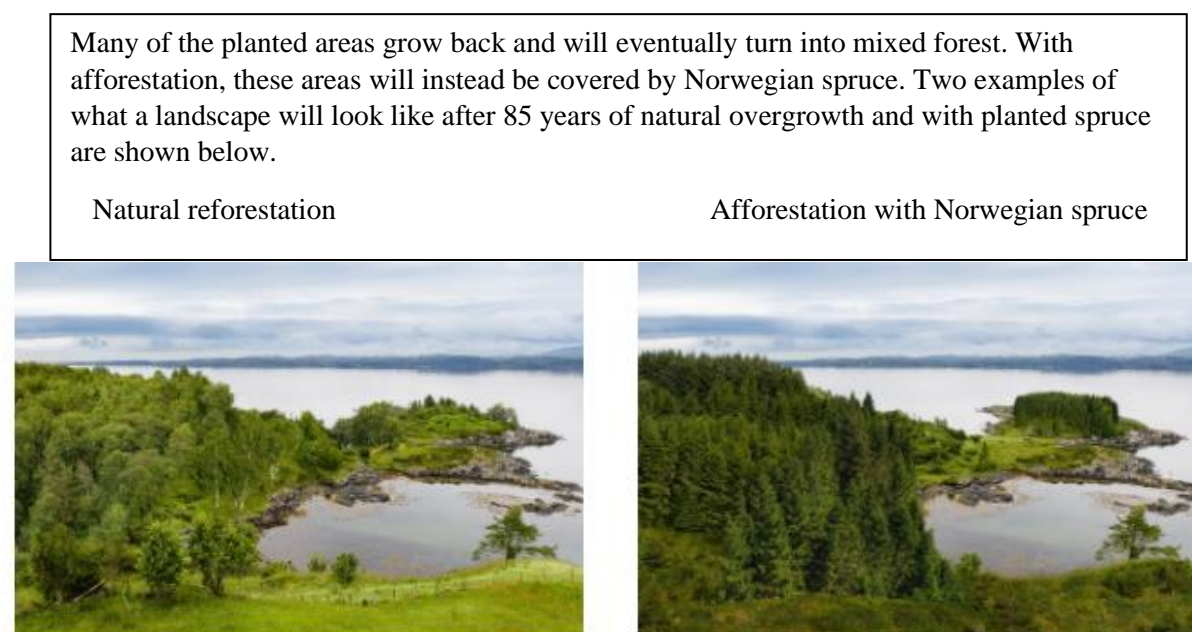
The scenarios contained information about the climate forest planting. Immediately after the scenarios were presented, the WTP question was introduced. This procedure of presenting the scenarios and then informing the respondents that they will be presented with a WTP question afterwards, is called "advance disclosure" (Bateman, et al., 2004, p. 4).

In both survey panels, the WTP question was presented with bar charts showing potential consequences for the areas where the afforestation might happen. Furthermore, the WTP question introduced a payment card with a dynamic slider with a moving marker along a scale, which provided the respondents the opportunity to select an amount from 0 to 12000 NOK. The benefit of using a payment card is that the respondents' WTP is directly deduced from the card, as opposed to the dichotomous choice approach (Mitchell & Carson, 1981.) A downside with the payment card approach is that it could be afflicted by range effects. This means that the respondents could have a tendency to select WTP amounts around the midpoint of the payment card (Mitchell & Carson, 1981). The respondents were also offered a possibility of choosing "don't know", in order to leave out careless responses, or to choose an amount higher than 12000 NOK. This is according to best practice recommendations issued

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[1]The text above figure 1 has been translated

by the NOAA panel (Arrow et al., 1993) The payment card specified that the WTP-amount the respondents reported would be covered by a one-time-fee charged to the households. Above the dynamic slider the questions pointed out that a higher WTP reported would lead to more climate forest planting and thus more CO_2 captured. However, the higher WTP reported, the more it would affect the household's budget.

3.3.1 The different payment card versions of the surveys

Both in the Norstat survey panel and in the Citizen survey panel, the respondents were randomly assigned to two different versions of the surveys. The first version, called the *citizen perspective*, asked the respondents how much, in monetary values, they believed the *society* should pay for afforestation. In the second version, called the *consumer perspective*, the respondents were asked how much, in monetary values, they believed their *household* should spend on afforestation. The purpose of the two different perspective versions was to, by comparing them, attempt to elicit to what extent the respondents answered as a *citizen* or as a *consumer*.

In the *consumer perspective*, asking for the households WTP for afforestation, the respondents were presented with a standard fixed choice, common in the CVM literature (Mitchell & Carson, 1981) (Johnston et al., 2017). In this payment card version the figure was fixed, so that the graphic bar charts showing the amount of area that would be planted did not change regardless of how much the respondent chose to pay on the dynamic WTP-slider. Furthermore, in the *consumer version*, the respondents were asked for their WTP for afforestation on half of the area as opposed to the *citizen perspective*. It is unclear why the researchers chose this approach for the surveys. A reasonable explanation could be that stating a WTP on behalf of the household for the whole area containing a total of 9600 km^2 could be perceived as a to comprehensive task for the respondents. Regardless of the underlying reason for this approach, it does not matter in regard to the upcoming analysis as each respondents only received one version of the WTP question[2].

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[2] It is however necessary to keep the information in mind, as it will affect the mean WTP when comparing the two different perspectives.

Figure 2) Consumer version of the two surveys (asking for afforestation WTP on behalf of the household on half of the proposed area). Note that the bar charts indicating the amount of area being affected does not change regardless of how the slider is moved [3] .
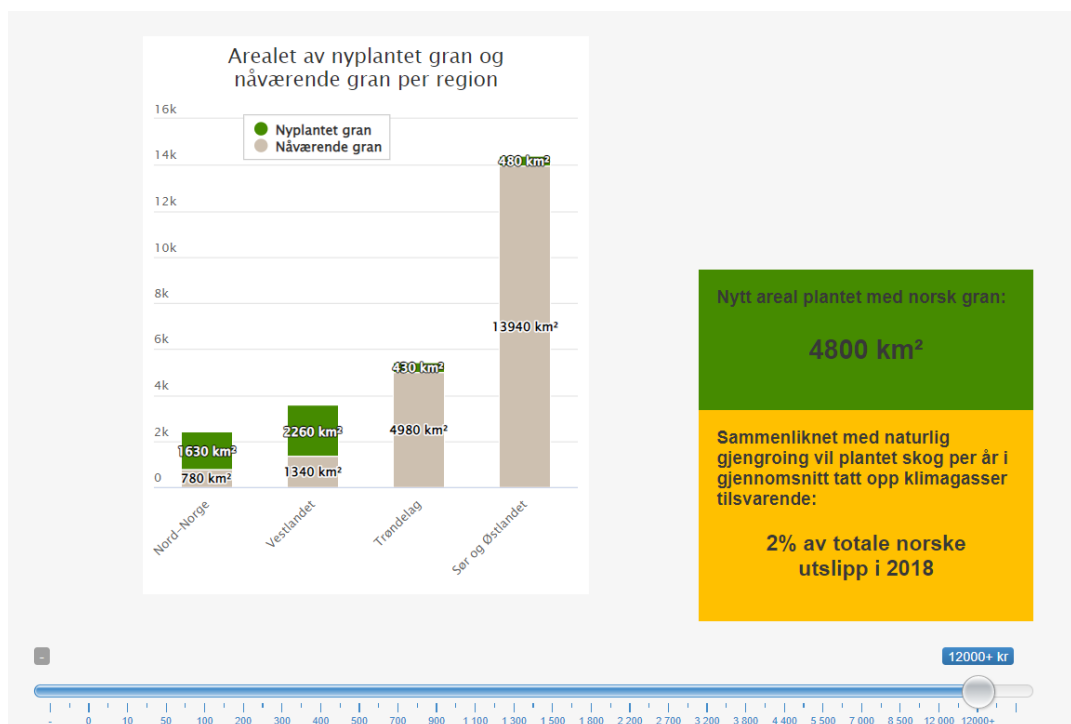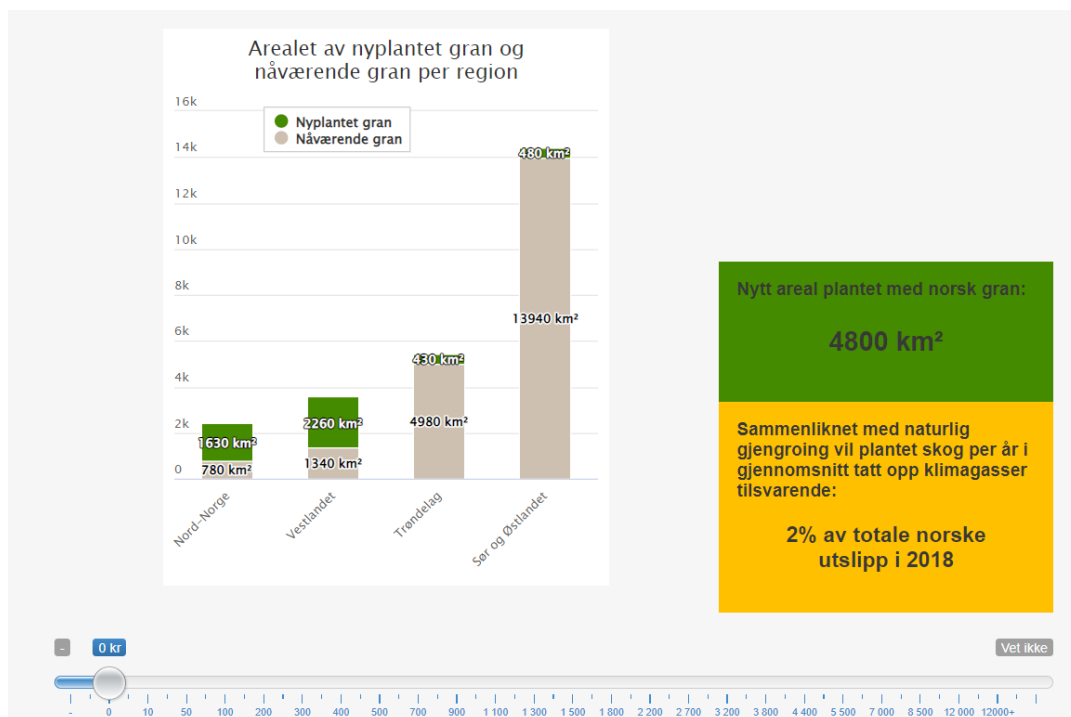
However, in the *citizen* perspective, asking for the respondents WTP for afforestation on the whole area, the respondents were presented with bar charts showing graphically how the

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[3] Screenshots from the Citizen Panel are presented here. However, the survey design was identical in the Norstat-panel

respondent's choice affected the area afforested, and how their choice had an impact on the total CO_2 captured by the forest planting.

This "dynamic payment card" perspective, inspired by Grimsrud, Lindhjem, Vestre Sem and Rosendahl (2019) is not very widespread. Most CV-studies ask for individual or household WTP. However, in the two surveys presented above, one of the perspectives allowed the respondents to answer on behalf of society. By using a dynamic payment card, it allows for the respondents to observe how their stated WTP affects the area in question. Therefore it could make sense to use a dynamic payment card version, allowing the respondents to see in the graphical image how their stated WTP would affect the quantity of forest planted and thus it's consequences for the society.

Figure 3) The payment card as presented in the citizen perspective, with the "dynamic payment card" version. Note that the bar charts indicating the amount of area being affected changes depending on how the slider is moved
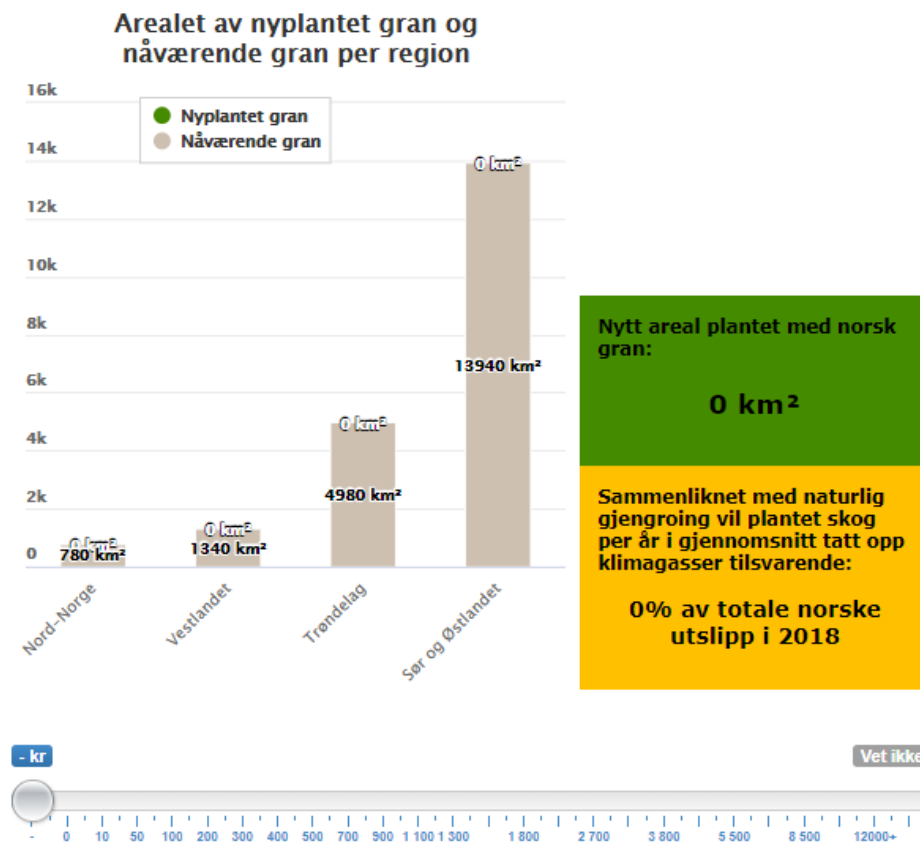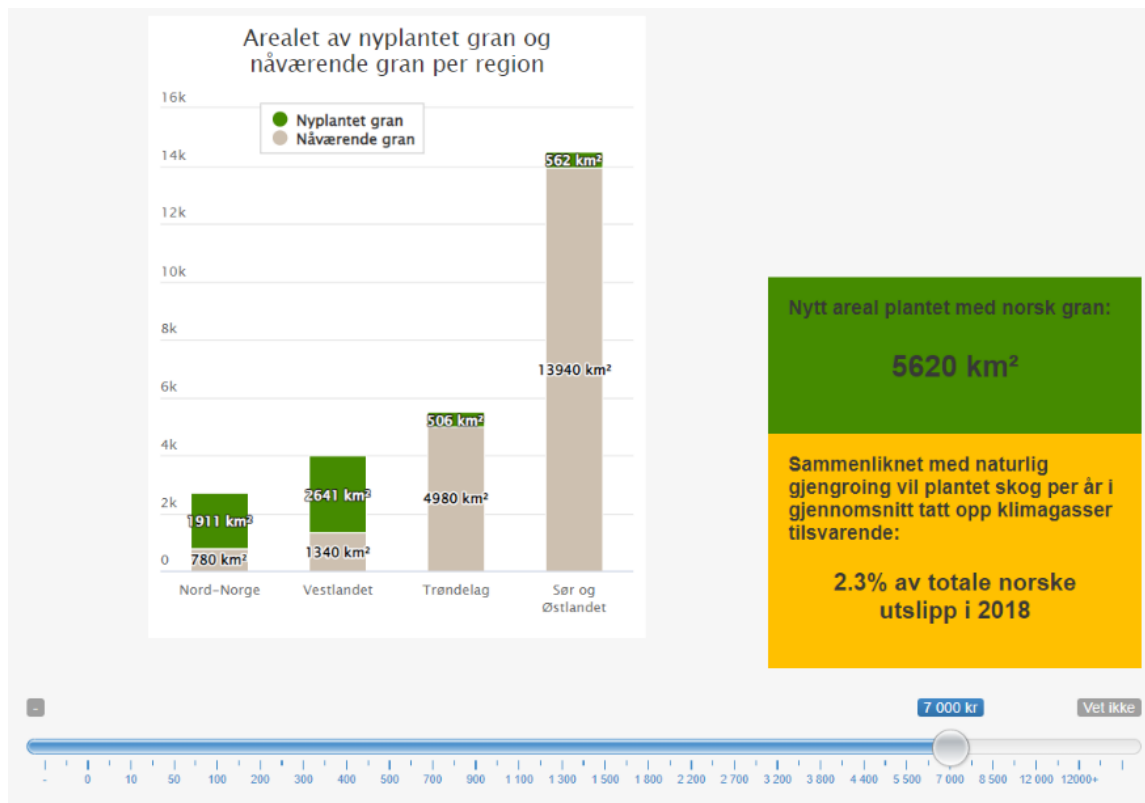
With the purpose of experimental research on survey design, in specific examining demand effects in stated preference studies (SP), the respondents were further randomly assigned to two different "scripts". Given the importance of the script treatments, an extra attention on this will be given in the following.

3.3.2 The different script treatments for the surveys

Respondents within each perspective of the WTP question were randomly assigned to one of the two scripts: the standard script or the alternative script. The standard script was like a normal CV-survey, explaining the respondents that their answers are important. The script asked (translated from Norwegian):

"How much do you think society should spend on forest planting?"

followed by

"Your answers are important and will be taken into consideration in regard to afforestation-treatment".

This follow-up is known as consequentiality, where the respondents are told that their answers are influential. This is one of several means to avoid hypothetical bias in CVM studies (Carson & Groves, 2007).

The alternative script included a "cheap talk", stating the importance of the respondent answering his true WTP, inspired by Carlsson et. al. (2018)'s research on demand effects in SP surveys. The purpose of the alternative script was to avoid social desirability bias by highlighting the importance that the respondents answered honestly and not from a "citizen perspective", see figure 4 in appendix.

The formulation in the alternative script was identical, but introduced a "cheap talk" treatment, with the following formulation (translated):

> "Why is your opinion important? In this survey, it is important that you consider what you think society should do. You should also consider what your and other households may be willing to pay, if any, for afforestation. Afforestation is one of several possible climate measures, and Norway has also other environmental goals to take into account. Remember that we want your opinion on what society should do, not the experts'. There is no right or wrong answer, as long as you answer what you mean. Ask yourself: Do I think there is enough uptake of greenhouse gases in the vegetation as it is, or do I think we should invest in afforestation measures?"

Following recommended practice for CV studies (Johnston et al., 2017) the surveys provided a follow-up question, asking the respondents to state their reasons for why they reported a WTP, or why they did not or why they were unsure. This will in the following be used as a tool to obtain the protestors and the true zero bidders to further analysis.

The remaining part of the surveys requested information on several characteristics about the respondents, such as risk-preference, education level, motivation for participating in surveys and income. These characteristics prove to be useful as explanatory dummy variables in the upcoming regression-analyses.

Table 1) Both survey panels, with the "citizen" perspective and the "consumer" perspective together with the two script variants presented in a 2x2x2 matrix. A random sample of respondents from the two surveys (Norstat panel and Citizen panel) answered one type each

treatment	*citizen* perspective, asking for citizen WTP Containing a payment card with a dynamic slider		*Consumer* perspective, asking for household WTP Containing a payment card without dynamic slider	
standard script *	Norstat panel	Citizen panel	Norstat panel	Citizen panel

alternative script #				
	Norstat panel	Citizen panel	Norstat panel	Citizen panel

* Standard procedure, normal survey procedure. The script explains the respondents that their responses will be important («consequential»).

Alternative script emphasizing even more that the respondents should respond honestly and truthfully. The script attempts to avoid any so-called «social desirability bias»

To summarize: the Norstat panel and the Citizen panel both contained two different perspectives. The citizen perspective asked how much the respondents believed the society should pay for afforestation. The consumer perspective asked how much the respondents believed they personally (on behalf of the household) should pay for afforestation. The purpose of these two different perspective-versions was to examine whether WTP differs significantly depending on which perspective the respondents are assigned to. Each of the two perspectives contained a standard script treatment and an alternative script treatment. The purpose of these different script treatments was to examine whether the formulations of WTP questions in CV studies might affect the WTP. Each respondent answered only one WTP question.

The rather complicated way the Norstat- and the Citizen panel-surveys were conducted creates possibilities to examine a variety of different obstacles associated with SP studies. Two of these methodological issues will be highlighted and discussed in this thesis. The citizen perspective and the consumer perspective with the two script treatments will prove to be vital in order to answer the first research question. By adding the total WTP for each of the two survey panels together, it is possible to compare the mean total WTP between the survey panels in order to answer the second research question.

4. Data

4.1 Research questions

The CVM has its limitations in the way it tries to elicit the value of environmental goods. This thesis examines some of these methodological issues.

The problems presented in this thesis are as follows:

I) Are there significant differences between the standard script and the alternative script?

II)	Are there significant differences for WTP for afforestation between the survey panels and if so, could underlying motivations explain these differences when controlling for socioeconomic characteristics?

The following will present the approach to answers these questions.

Before implementing the analyses answering the research questions, it is necessary to clean up the data. By using the statistical software Stata, the two datasets containing the surveys have been merged. In order to calculate WTP responses, it is necessary with a clarification on how the WTP values from the payment card has been retrieved. One downside of the payment card approach is that it is challenging to elicit the respondents true WTP, as it may lie in the range between two intervals on the payment card slider (Cameron & Huppert, 1989). In this thesis, it is therefore assumed that the respondents true WTP lies directly in between the two intervals. A stated WTP of 500 is thus assumed to be the true WTP of 450 since it lies in the midpoint of 400 and 500. Furthermore, the relatively few responders stating a WTP of 12000 NOK are assigned the maximum WTP of 10250 (midpoint between 8500 and 12000 NOK, see payment card in figure 2). Furthermore, the most important explanatory variables for the analyses have been transformed to dummy variables. Following best practice recommended by the NOAA panel, the next sections will report some descriptive information about the respondents and then discuss the representativeness (Arrow et al., 1993). The second part describes the treatment of removing protestors from the data ahead of the analysis in chapter 5.

4.2 Representativeness

The Norstat-panel and the Norwegian Citizen-panel was sampled to be representative for the Norwegian population. In the Norstat panel the distribution is slightly overrepresented of respondents over 60 years of age. The distribution of sex is approximately evenly distributed in both panels. Approximately 79% of the respondents are only member of one survey panel, and 78% of the respondents have answered more than one survey during 2020. 61% of the respondents in the Norstat panel and 62 % of the respondents in the Citizen panel has obtained an education level above high school. The amount of relatively well-educated respondents could indicate an overrepresentation of this socioeconomic characteristic. However, the Norwegian population is well-educated on average compared to other European countries (Eurostat, 2021). Therefore, the sample distribution is regarded to be representative.

4.3 Descriptive statistics

In total 2377 respondents answered the survey containing the afforestation questions relevant for this thesis. 5460 respondents from the Norstat panel were invited to participate in the survey that was carried out in June 2020. In total 1500 respondents participated in the survey, thus achieving a response rate of approximately 27 %. 1227 respondents from the Norstat panel completed the survey[4]. The Citizen panel recruits a high number of respondents, and the survey consisted of many additional questions irrelevant for this CV study. It is therefore challenging to observe the final response rate for the responders that completed all the questions containing the afforestation part of the survey. By studying the data, we observe that 1150 respondents fully completed the parts of the survey relevant for this thesis. The Citizen panel had an overall response rate of 71,8 % in the survey relevant for this thesis (Skjervheim, Høgestøl, Bjørnebekk, & Eikrem., 2020)[5].

1195 respondents answered the citizen perspective of the surveys, while 1182 respondents answered the consumer perspective. 1156 respondents answered the survey-version containing the standard script, while 1221 participants answered the alternative script, empathizing the importance of answering truthfully.

Table 2) Total response rates for the Norstat panel and the Citizen panel assigned to the different versions and scripts

treatment	citizen perspective citizen WTP (N=1195)	consumer perspective household WTP (N=1182)
standard script (N=1156)	(N=592)	(N=564)
alternative script (N=1221)	(N=603)	(N=618)

Several variables are necessary for the analyses in order to answer the research questions. In the upcoming regression, the dependent variable has been transformed to the logarithmic form *ln(1+WTP)*. A benefit of transforming the dependent variable to a logarithmic form is that it

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[4] At the time this thesis was written it was not possible to get the partial and full responses confirmed. However, by examining the data, I assume that 1227 respondents completed the whole Norstat survey.
[5] For the current wave, new panel members were recruited. The response rate for the new recruitment wave was around 15%. For a thoroughly review of the recruitment method, see (Skjervheim , et al., 2020)

makes the model more closely to satisfy the classic linear model assumptions (Woolridge, 2018). Furthermore, the analyses use the natural logarithm for the *income*-variable. Since the *altruism*-variable asks how much the respondents are willing to give to charity, within an interval of 0 to 10000 NOK, it is beneficial to transform this variable into a logarithmic form as well. This is beneficial as the transformation makes the WTP and the *altruism*-variable more normally distributed. An advantage of using the logarithmic version of the *income* variable is that it narrows its range. The additional 1 avoids that zero bidders are interpreted as stating a value of -∞ (Wooldridge, 2018). The same approach was taken for the *altruism* variable. The rest of the variables are transformed to dummy variables. A few clarifications with regard to the dummy variables are necessary. Most of the variables in the two surveys were presented on a scale from 0-10. These were divided dichotomous into ranges 0-5 and 6-10. Furthermore, the surveys were conducted during the COVID-pandemic. Following the WTP questions, the respondents were therefore asked if they would have answered the same WTP amount in a normal situation without COVID. These are presented in table 4 as *Without_Covid* and *Coronafund* and will be used in the following analyses. Finally, the variable *Under50years* was coded as 1 for all respondents below that age, 0 otherwise. The reason for this transformation was that in the Norstat panel, the question asking the panel members for their age allowed the respondents to type in their age in numerical values. In the Citizen panel however, the only possibility for the respondents was to choose between different decades which they were born in. Due to the complexity of this, the chosen approach was to code the variable as described. Table 3 shows an overview of the dummy variables used in the analysis.

Table 3) List of dummy variables

Variables	Definition
Male	Gender variable, 1 if male, 0 if female
PoliticsRight	Economic left or right in politics. 1 if right oriented or towards centre, 0 otherwise
Climateconsequence	How negative or positive do you believe the overall consequences of climate change in Norway will be? 1 if positive/very positive, 0 otherwise
Without_Covid	Would you have entered the same WTP in a situation without COVID? 1 if yes, 0 otherwise
WTP_reason1	Most important reason for WTP for reforestation. 1 if climate reasons, 0 otherwise

WTP_reason2	Most important reason for WTP for reforestation. 1 if altruistic reasons, 0 otherwise
Coronafund	How willing would you be to give money to a fund which could finance extra measures to reduce the effects of COVID? 1 if willing/very willing, 0 otherwise
Risktaking	How willing are you to take risks? 1 if willing/very willing, 0 otherwise
Goodmath	How would you estimate your math knowledge? 1 if good/very good, 0 if bad/very bad
Motivation_reason	Main motivation to be member of panel surveys? 1 if altruistic reasons, 0 otherwise
Online surveys	How many internet surveys have you answered in 2019? 1 if more than one, 0 otherwise
Educationlevel	Highest completed education. 1 if more than high school, 0 otherwise
Under50years	Age-variable, 1 if under 50 years of age (born after 1970), 0 if else
Norstat	Dummy for dataset, 1 if Norstat, 0 if Citizen panel (Medborger panel)

Table 4) Descriptive statistics of variables, Norstat panel and Citizen panel

Variables Norstat panel	Obs	Mean	Std. Dev.
Log of altruism	1218	3.977	3.515
Male	1227	.493	.5
PoliticsRight	1222	.394	.489
Climateconsequence	1227	.17	.376
Without COVID	1224	.858	.349
Climate WTP	985	.68	.467
Altruistic WTP	985	.157	.364
Coronafund	1224	.287	.452
Risktaking	1214	.246	.431
Goodmath	1216	.497	.5
Motivation reason	1227	.661	.474
Online surveys	335	.734	.442
Log of income	1227	11.187	4.515
Educationlevel	1212	.618	.486
Under50years	1227	.464	.499
Variables Citizen panel	Obs	Mean	Std. Dev.
Log of altruism	1109	4.356	3.498
Male*	12534	.495	.5
PoliticsRight	2405	.39	.488
Climateconsequence	1150	.139	.346
Without COVID	1130	.814	.389
Climate WTP	645	.783	.413
Altruistic WTP	645	.126	.332
Coronafund	1150	.283	.45
Risktaking	1150	.217	.412
Goodmath	1150	.492	.5
Motivation reason	1150	.879	.326
Online surveys	170	.865	.343
Log of income*	6276	12.739	1.96
Educationlevel*	12216	.628	.483

*The Citizen panel contained a vast number of questions not relevant for this thesis. It was challenging to exclude the *marked socioeconomic variables only relevant for this thesis from the other parts of the survey without contaminating the data.

Estimating the mean WTP will be the preferred approach in the following analysis (Blamey et al., 1995). However, due to the large dispersion in the stated WTP, it is beneficial to also report the WTP in median values (Wooldridge, 2018).

Table 5) WTP for standard script and alternative scripts for the surveys

Variables Citizen panel	Obs	Mean	Std. Dev.	Median
WTP_Citizen1 (Std. script)	219	1244.772	2250.639	450
WTP_Citizen2 (Alt. script)	215	1100.116	1945.432	450
WTP_Consumer1 (Std. script)	205	645.244	1324.581	150
WTP_Consumer2 (Alt. script)	221	822.127	1551.637	450
Variables Norstat panel	Obs	Mean	Std. Dev.	Median
WTP_Citizen1 (Std. script)	313	1352.78	2306.072	450
WTP_Citizen2 (Alt. script)	305	1336.459	2105.389	450
WTP_Consumer1 (Std. script)	299	613.813	1044.559	250
WTP_Consumer2 (Alt. script)	307	764.251	1530.59	350
Log of WTP_Tot	1224	4.904	2.867	6.111
WTP_Tot	1224	1020.584	1849.481	450

It is interesting to observe the WTP data presented above. The median WTP's are much lower compared to the mean WTP's for many of the reported WTP data. This could indicate that there are respondents that state a very high WTP. By examining the data, we observe that many respondents reporting zero or low income state a high WTP. The chosen approach here is to consider the respondents stating a WTP more than 5% of their income as outliers. All respondents earning less than or equal to 250001 NOK stating a WTP of 12500 NOK are thus considered as outliers. The highest point on the payment card with midpoints are 10250 NOK. This means that all respondents stating a WTP of 10250 NOK earning 250001 NOK or less are removed. This also includes the no responses for the income-variable. Based on this delimitation, 20 responses are regarded as outliers in this thesis. Outliers might contaminate the results in the analysis (Stock & Watson, 2020). However, treating outliers should be conducted with cautious. Due to the relatively few outliers, the preferred approach will be to

keep them in the main analysis. However, in sections 5.1.3 and 5.2.1 there will be conducted a sensitivity analysis on this.

Finally, we can see that on average the respondents answering the citizen perspective in both surveys state a much higher WTP compared to the consumer version. This is related to the chosen approach of asking the respondents answering the consumer version of the surveys about their WTP for afforestation on half of the area, cf. section 3.3.1. This finding will be further discussed in chapter 6.

4.4 Removing protestors

The surveys provide the respondents an option to answer don't know (DK) to questions. A benefit with this is that it prevents uncertain or uninformed respondents to feel pressure on reporting on questions they are unsure about (Groothuis & Whitehead, 2002). This is crucial as it may lead to biases and thus reduce the quality of the survey. On the other hand, offering a DK alternative might discourage respondents to make the necessary effort of answering the survey in a satisfying way (Krosnick et al., 2001). Also, removing these respondents from the analyses during data treatment might conduct a smaller sample size than necessary.

In the two surveys relevant for this thesis, the WTP questions were followed up with questions on the most important reason to why the respondents answered "yes", "no" or "don't know" to the proposed policies. This is beneficial as it gives the researcher a tool for further examination of the respondents elicited WTP. By studying the answers, it is possible to divide the respondents into true zero bidders and protestors. Protestors are respondents who protest against the policy proposed, in contrast to true zero bidders who are genuinely unsure about their WTP, or against the policy for well-considered reasons (Groothuis & Whitehead, 2002).

To study reasons to why respondents answered "no" or "don't know" to the questions is useful for the empirical study but could also prove important for the decision makers. The literature is diverging in how to handle the "no" or "don't know" responders. Garcia Llorente, Martìn-Lòpez and Montes (2011) suggest that protestors can be useful in empirical analysis as it may lead to more specific and suitable environmental programs that may receive greater public support.

Other literature suggests removing protestors from the data in order to elicit the true WTP for the remaining respondents (Arrow et al., 1993) (Strazzera, Scarpa, Calia, Garrod, & Willis, 2003). As this is the most common strategy, it will be the approach taken in this thesis. Figure

6 and 7 in the appendix show the reasons stated and the number of respondents answering the questions on why they answered zero or DK. In the analysis, the following reasons for stating zero or DK were treated as protestors and thereby eliminated from the analysis:

- "I think it was too difficult to state an amount"
- "I don't think it is right to value the environment in money"
- "I believe the taxes and fees are high enough already"
- Other
- Don't know
- Not answered

The remaining true zero bidders were kept for further analysis. It was further assumed that the remaining DK'-s disagreed with the proposed policy, and they were therefore treated as zero.

After removing the protestors, the two surveys contained 1036 respondents answering the standard script, and 1048 respondents answering the alternative script.

5. Analysis and results

After the description of the data in the section above, the following part will seek to answer the research questions stated for this thesis. The first section will compare the means estimated for consumer WTP (asking how much the respondents believe their household should pay for afforestation) and for citizen WTP (asking how much the respondents believe the society should pay for afforestation) for the two surveys combined. This part is straightforward, by using a simple Welch's t-test for comparing means with unequal variances. The purpose of this analysis is to determine whether the alternative script, emphasizing consequentiality, has any significant effect on the stated WTP for afforestation. The second part will attempt to compare the individuals' estimated mean total WTP for afforestation between the two panels. The mean total WTP between the two panels will be analyzed by using a Welch's t-test in order to examine if there are significant differences. A tobit regression, controlling for socioeconomic characteristics, will also be conducted. By including variables that could explain underlying motivations, the purpose of this part is to highlight explanations to why such differences might arise.

5.1 Comparing means for script treatment

The results from the Norstat panel and the Citizen panel has been merged for practical reasons, in order to perform tests controlling for unequal variances when comparing the mean

WTP in between the two different script treatments. As the sample size is large the central limit theorem applies. This ensures normality of the probability distribution, and justifies the use of a t-test (Stock & Watson 2020). The chosen approach here is to conduct a Welch's t-test for unequal variance. The test is preferred when comparing means for two different populations when there is unequal variance and unequal sample sizes (Lu & Yuan, 2010). The test is used to test the null hypothesis that two populations have equal means. This part of the analysis will for the purpose of studying the mean WTP in monetary values examine the true mean WTP, as opposed to the logarithmic form. The standard script is denoted with index number 1 and the alternative script with the index number 2. The hypothesis for the citizen perspective is stated as follows:

$$H_0 = \overline{WTP\_Citizen}_1 = \overline{WTP\_Citizen}_2$$

$$H_A = \overline{WTP\_Citizen}_1 \neq \overline{WTP\_Citizen}_2$$

The hypothesis for the consumer perspective logically follows:

$$H_0 = \overline{WTP\_Consumer}_1 = \overline{WTP\_Consumer}_2$$

$$H_A = \overline{WTP\_Consumer}_1 \neq \overline{WTP\_Consumer}_2$$

The null hypothesis will be that the two script treatments are equal. If not, we can reject the null hypothesis with a p-value of .05, and a corresponding |t|-value > 1.96 (Stock & Watson, 2020). If so, the differences between the mean WTP for the two scripts are statistically significant, and the differences are according to econometric literature, not due to coincidence.

Table 6) Welch t-test for citizen and consumer perspective, comparing script treatments

Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Citizen}_1$	532	1308.318	98.933	(1113.969, 1502.666)
$\overline{WTP\_Citizen}_2$	520	1238.74	89.555	(1062.804, 1414.677)
P-value: .602	T-value: .521			
Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Consumer}_1$	504	626.597	51.912	(524.605, 728.589)
$\overline{WTP\_Consumer}_2$	528	788.475	66.942	(656.967, 919.983)
P-value: .056	T-value: .-1.910			

5.1.1 Citizen perspective

In the citizen perspective, where the surveys asked the respondents what they believe it is worth for the society to spend on afforestation, a p-value of .602 is obtained, which means that we can not reject the null hypothesis, even at a 10 % level. The alternative script (WTP_Citizen$_2$) is not significantly different from the standard script. In fact, the mean WTP in the standard script is higher compared to the alternative script. The confidence level lies within an interval of approximately (1113.969, 1502.666) for the standard script and (1062.804, 1414.677) for the alternative script. The spread in the confidence intervall is quite big. However, taking the relatively high number of observations into account, this could be considered as a good estimate.

5.1.2 Consumer perspective

For the consumer perspective, asking the respondents what it is worth for their household to plant climate forest, the results gave a p-value of .056. The confidence level is (524.605, 728.589) and (656.967, 919.983), respectively. We see that we can barely not reject the null hypothesis at a 5% level with the observed p-value. However, the null hypothesis is true at a 10 % significant level. Furthermore, an obtained one-tailed p-value (mean$<H_0$) of .028 indicates that the standard script (WTP_Consumer$_1$) gives a significantly lower WTP compared to the alternative script. These result are interesting and will be further discussed in chapter 6.

5.1.3 Sensitivity analysis

Sensitivity analyses can provide transparency for the analysis and can also provide insight for future research on the topic (Champ et al., 2017). It is therefore useful to conduct an analysis to check whether the mean comparison is sensitive to changes. The analysis above has removed protestors and treated the remaining "don't know's" (DK's) as zeros. This is in line with today's literature where it is normal to either remove them from the sample or treat them as opposers to the proposed environmental good (Carson & Hanemann, 2005). The conservative approach to this way of eliciting WTP is to treat all DK's as opposers. This tends to underestimate the WTP for the consumers (Carson & Hanemann, 2005). As described above, the current surveys introduced follow-up questions to the DK's so that they could state the reason for their zero respond, as suggested by the NOAA-panel (Arrow et al., 1993). By using the information described above, it is possible to perform a sensitivity analysis to check whether the results are robust to the removal of DK responses.

In the above analysis 532 respondents from the two panels answered on the WTP question from a citizen perspective with the standard script (WTP_Citizen$_1$). The mean WTP was approximately 1308 NOK. Adding the protest zero's back again increased the respondents to 636 with a mean WTP of around 1094 NOK. For the citizen perspective with the alternative script (WTP_Citizen$_2$) the respondents increased from 520 to 636 with a mean WTP of approx. 1013 NOK. For the standard script from the consumer perspective (WTP_Consumer$_1$) 131 protestors were added back again to total 635 respondents, with a mean of approx. 497 NOK, while the alternative script from the consumer perspective (WTP_Consumer$_2$) changed from 528 respondents to 643, with a change of mean WTP from 788 to 647. As expected, the mean WTP was reduced in all samples when the protestors were included. Also, the difference between the scripts in the citizen perspective was not significantly as in the above analysis. However, the p-value was slightly lower. The citizen perspective obtained a p-value of .473 and a t-value of .717. In the consumer perspective however, the difference between the scripts when the protestors are included is significantly different at the 5% level with a p-value of .033 and a |t|-value of -2.131. Furthermore, the one-tailed p-value (mean$<H_0$) gives a p-value of .016.

Table 7) Sensitivity analysis with mean comparison

Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Citizen_1}$	636	1094.379	84.941	(927.579, 1261.179)
$\overline{WTP\_Citizen_2}$	636	1012.807	75.630	(864.292, 1161.322)
P-value: .473	T-value: .717			
Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Consumer_1}$	635	497.330	42.407	(414.055, 508.607)
$\overline{WTP\_Consumer_2}$	643	647.457	56.239	(537.021, 757.894)
P-value: .033	T-value: -2.131			

As the surveys provided sufficient information on why the DK's stated a WTP of zero, the chosen approach is to remove the protestors in the analysis instead of the conservative approach presented in this section. This is also supported in the CV literature (Arrow et al., 1993) (Carson & Hanemann, 2005).

An additional sensitivity analysis is conducted. In the following, the outliers are removed, i.e. respondents with low income reporting the maximum WTP based on midpoints. As discussed in section 4.3, 20 respondents will be removed from this analysis.

When conducting the Welch's t-test after removing the outliers, the following results are obtained.

Table 8) Outliers and protestors removed

Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Citizen_1}$	530	1288.349	97.807	(1096.210, 1480.488)
$\overline{WTP\_Citizen_2}$	520	1238.740	89.556	(1062.804, 1414.677)

P-value: .708   T-value: .374

Variable	Obs	Mean	Std. err.	[95% CI]
$\overline{WTP\_Consumer_1}$	503	627.8429	52.001	(525.677, 730.009)
$\overline{WTP\_Consumer_2}$	524	793.111	67.412	(660.676, 925.546)

P-value: .053   T-value: -1.941

The data does not change notably. In addition to in total 7 more observations, the mean WTP for the different versions barely increases. Like in the Welch's t-test including the outliers, the consumer version is significant at the 10% level and nearly significant at the 5% level, when comparing the two script treatments. It is however interesting to observe that the citizen perspective of the survey with the standard script (WTP_Citizen$_1$), the mean WTP increases with 20 NOK. This is much more compared to the other perspectives. This could indicate that more respondents assigned to the citizen perspective with the standard script report unrealistically high WTP.

The rest of the removed outliers did not answer on the income-question and are therefore not captured in this analysis.

5.2 Comparing the Norstat survey panel and the Citizen survey panel

This section seeks to examine the second part of the analysis, where the goal is to investigate whether there are significant differences between the two survey panels. The analysis will compare the mean total WTP reported for the two surveys by using a Welch's t-test. The purpose of this is to examine whether the two survey panels, containing different respondents, report significantly different WTP. By presenting a tobit regression model, the analysis attempts to investigate whether any differences could be due to underlying motivations, i.e. if

any respondents could be associated as altruistic citizens as opposed to selfish consumers. In addition, the analysis controls for socioeconomic assemblage.

5.2.1 Comparing total mean WTP between the survey panels

For the purpose of comparing the surveys in order to examine whether the respondents in the two survey panels state a statistical significantly different mean WTP, the following presents a Welch's t-test for comparing the total mean WTP between the two panels. By using the dummy variable indicating 0 if Norstat panel and 1 if Citizen panel, the test obtains the following result.

Table 9) Welch's t-test comparing mean total WTP between the surveys

Group	Obs	Mean	Std. err.	[95% CI]
Norstat panel	1,224	1020.584	52.864	(916.870, 1124.298)
Citizen panel	860	957.087	62.093	(835.215, 1078.959)

P-value: .436   T-value: .778

An obtained p-value of .436 is significantly higher than .05, and it is reasonable to conclude that the differences in mean total WTP between the Norstat panel and the Citizen panel is not statistically different. The analysis obtains small deviations in the 95% CI. The standard errors indicate that the data is not very widespread, this implies an accurate analysis (Stock & Watson, 2020). Even though the two survey panels are not significantly different, the analysis can still pick up significant trends in the data by conducting a tobit regression in order to compare explanatory variables.

5.2.2 Tobit regression

The tobit model is beneficial for capturing corner solutions in a situation like here where there is a large fraction of zero responses (Wooldridge, 2018). As the dependent variable for WTP cannot be below zero, the censored tobit model is adapted to fit for the following regression analysis (Wooldridge, 2018). The model can be derived as followed

$$Y_i^* = \beta_0 + \beta_1 X_i + u_i, where\ u\ |\ x\ \sim Normal\ (0, \sigma^2), i = 1, ..., n$$

$$y = \max (0, y^*)$$

Where Y_i^*, satisfying the classical linear model assumptions, is the desired level of WTP like in a normal linear model (Woolridge, 2018)[6]. The difference is that the Y_i^* contains a cut-off

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[6] The classical linear model assumptions are: 1) linearity in parameters 2) random sampling of observations 3) no perfect collinearity 4) zero conditional mean 5) homoskedasticity and 6) normality (Woolridge, 2018).

(minimum WTP). The respondent pays this cut-off and spend the observed amount $Y_i = Y_i^*$. However, if Y_i^* is less than the cut-off, spending of $Y_i = 0$ is observed instead (Stock & Watson, 2020).

The following tobit model uses *ln(1+WTP)* as the dependent variable. The explanatory variables *lincome* and *laltruism* are transformed to the logarithmic form. The rest of the explanatory variables are the dummy variables introduced in chapter 4. The analysis will conduct tobit regressions by adding more variables that are expected to influence WTP gradually to check whether the model is affected by an increase of variables. By running the same regression for both surveys, the purpose is to examine whether there are any underlying motivations that significantly differ between the two survey panels, when controlling for socioeconomic characteristics. Table 10 shows the tobit regression for the Norstat panel and the Citizen panel.

Table 10) Left censored, robust tobit regression

Dependent variable: ln(WTP_Tot+1)				
	(1) Tobit Norstat 1	(2) Tobit Norstat 2	(3) Tobit Citizen panel 1	(4) Tobit Citizen panel 2
Log of altruism	0.0561*** (0.0157)	0.00792 (0.0300)	0.0355 (0.0254)	-0.0397 (0.0649)
Male	0.190 (0.107)	0.136 (0.209)	0.0990 (0.190)	0.386 (0.317)
PoliticsRight	-0.216 (0.112)	-0.406* (0.200)	0.255 (0.175)	0.294 (0.490)
Climateconsequence	0.0952 (0.149)	-0.360 (0.300)	-0.336 (0.313)	-1.657 (0.902)
Climate_WTP	0.679*** (0.135)	1.865*** (0.365)	0.555 (0.305)	-0.986 (1.695)
Risktaking	0.365** (0.125)	0.470* (0.217)	0.250 (0.214)	0.357 (0.563)
Goodmath	0.134 (0.112)	-0.0997 (0.204)	0.168 (0.196)	-0.712 (0.508)
Motivation_reason	0.0121 (0.116)	0.0792 (0.220)	0.0338 (0.424)	1.173 (0.642)
Log of income	0.0132 (0.0129)	0.0107 (0.0229)	0.0165 (0.0435)	0.0440 (0.0608)
Educationlevel	-0.0136 (0.114)	0.0190 (0.218)	0.487* (0.205)	0.888 (0.481)
Without_COVID		-1.260*** (0.314)		0.195 (2.258)
Altruistic_WTP		1.323**		-3.294

		(0.417)		(2.198)
Coronafund		0.314		0.603
		(0.207)		(0.540)
Online_surveys		-0.00121		0.535
		(0.257)		(1.107)
Under50years		0.125		0.297
		(0.219)		(0.475)
Constant	5.062***	5.243***	4.735***	4.389
	(0.232)	(0.509)	(0.745)	(2.210)
Var(lWTP_Tot)	2.668***	2.366***	2.421***	2.008***
	(0.136)	(0.230)	(0.232)	(0.447)
N	939	267	314	49
Pseudo R2	0.019	0.057	0.025	0.080

Standard errors in parentheses
$^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

The Welch's t-test firmly illuminated that the total mean WTP compared between the two survey panels are not significantly different. Still, the tobit model obtained above picks up interesting results regarding the different characteristics between the respondents in the two surveys. Few of the variables that could be described as socioeconomic characteristics are significant in the model. This is true for both survey panels, and could indicate that the composition of the panel respondents are quite similar in terms of socioeconomic background. However, several of the variables indicating underlying motivations are significant in the Norstat survey panel. For this panel, we find that the following characteristics significantly influenced the mean total WTP when comparing the surveys.

- Altruism
- Climate WTP
- Altruistic WTP
- Without COVID
- Risk-taking
- Politics right

For the Citizen panel, only the socioeconomic variable *Educationlevel* significantly influenced the total WTP in the first regression. The variable however reduced its significance for the full sample Citizen panel regression.

The regression obtains a p-value of p<.001 for the variable *altruism* for the Norstat panel. The p-value however changes when running the full sample regression with all the explanatory variables, achieving a p-value of .792. It is challenging to conclude firmly on anything from

this result. However, the fact that the *altruism* variable is significant at the 1% level for the first Norstat regression could indicate that the members of the Norstat panel are more altruistic, and thus are more likely to pay for afforestation because of environmental issues compared to the members of the Citizen panel. We can also see that when the respondents were asked to state the reason for why they wish to pay for afforestation (*Climate_WTP* and *Altruistic_WTP*), a higher number of respondents answered altruistic reasons or environmental reasons in the Norstat full sample panel compared to the Citizen panel, with a p-value of $p<.001$ and .002, respectively. The variables are divided into altruistic and environmental reasons and are therefore good parameters for the "citizen perspective", essential for this analysis. Furthermore, the *Without_COVID* variable is significant at the 1 % level in the Norstat full sample survey but not in the Citizen panel full sample. This variable asked if the respondents would report the same WTP regardless of the COVID-pandemic.

It is interesting to observe that the members of Norstat are more willing to take risks than the respondents in the Citizen panel. This is indicated by a p-value of .003 for the first Norstat regression and .031 for the full sample Norstat-regression. Furthermore, the *PoliticsRight* variable has a p-value of .044 in the Norstat panel full sample regression. It is not clear why the significance is not present in the first Norstat regression. However, a negative coefficient in both Norstat panel regressions indicate that the respondents more left-oriented on the political axis are more likely to state a higher WTP for forestation.

Another interesting observation is that the *Educationlevel* variable is significant at the 10% level for the Citizen panel 1-regression. The variable is not significant for any of the Norstat regressions. Furthermore, we see that income is not present as statistically significant in any of the regressions.

It is beneficial to perform an additional analysis by executing a tobit regression where the Norstat dummy is added as an interaction term for the dummy variables. This is to further examine the effect on the independent variables when comparing the two surveys. See table 13 in appendix. The results obtained here are interesting. On average the coefficients when conducting a tobit regression with an interaction term seem bigger. The variables that are statistically significant for the tobit regressions are also significant for the interaction-term regression. However, the *altruism* variable is in this regression significant also for the Citizen panel. This increases the weight for the conclusion on the variables influencing the result.

A further discussion on these findings is presented in section 6.

5.2.3 Sensitivity analysis

The sensitivity analysis in this section will focus on removing the outliers from the analysis. As above, the 20 respondents who have low income but report the maximum WTP are removed. Table 11 shows the results obtained from the Welch's t-test.

Table 11) Welch t-test comparing mean total WTP between the surveys, outliers removed

Group	Obs	Mean	Std. err.	[95% CI]
0	1,218	1014.302	52.537	(911.230, 1117.374)
1	859	958.0268	62.158	(836.027, 1080.027)

P-value: .489   T-value: .692

The p-value still indicates that the differences in between the two survey panels are insignificant, although slightly lower when the outliers are removed (.436 < .489). The other data does not deviate much compared to the analysis where the outliers are included. It is however interesting to observe that one of the outliers answered the Citizen panel survey, while six respondents answered the Norstat panel survey. This indicates that only seven of the 20 outliers removed stated an income lower than 225001 NOK but a maximum WTP. By inspecting the datasets I find that the other respondents did not report any income and could be interpreted as missing values. The fact that most of the respondents defined as outliers answered the Norstat panel survey could influence the results in this part of the analysis. However, the main conclusion still holds since the p-value is not significant.

To further check whether the outliers influence the results, the tobit regression is run again, however excluding the outliers. The results do not deviate significantly from the main analysis. See table 12 in appendix. It is worth mentioning that in the tobit regression where the outliers are excluded, the Norstat panel 1 is missing four observations. In the other regressions however the observations remain the same. It is not clear why the outlier-respondent from the Citizen panel is missing. The missing outliers indicate that some of the respondents removed as outliers did not complete the survey, since they did not answer all the questions added in the full sample regressions. By comparing with the sensitivity analysis in section 5.1.3, it looks as though most of them answered the citizen version in the Norstat survey with the standard script. This could influence the result in that part of the analysis. However, by comparing the tobit regression without the outliers to the tobit regression where the outliers are included, it is reasonable to conclude that the outliers do not significantly affect the result.

Furthermore, a post-estimation test for heteroskedasticity is performed in order to check if the variance of the observations are uniform (Stock & Watson, 2020). By running tests for each regression, a statistically significant Chi-square test with $p<0.001$ for all but the full sample Citizen panel 2 regression is obtained. The full sample Citizen panel 2 regression has a p-value of .027. This could indicate that the models suffer from heteroskedasticity, reducing the explanatory power of the analysis.

6. Discussion and concluding remarks

The following sections will provide a critical discussion on the limitations of the survey in terms of threats to internal and external validity. Furthermore, the section will provide an evaluation of the research questions. Finally, I will give some concluding remarks.

6.1 Comparing means for script treatment

6.1.2 Limitations of the survey and analysis
Both the Norstat survey panel and the Citizen survey panel presented two different perspectives. The citizen perspective asked the respondents for their WTP for afforestation on the whole area presented. This perspective provided a payment card with a graphical image of bar charts that changed dynamically showing the afforestation rate when increasing the WTP. The consumer perspective asked the respondents for their WTP (on behalf of the household) for forest planting on half of the area. In this perspective, the bar charts on the payment card were static. These differences between the different perspectives of the two surveys might lead to difficulties when comparing results. The chosen approach of not providing the possibility of planting climate forest in the whole suggested area from the consumer-perspective of the surveys makes it challenging to compare the elicited mean WTP in a straightforward way. However, each respondent were only presented with one WTP question. Also, when comparing script treatment in the analysis, I only compare the two perspectives separately. These factors strengthen the validity, regardless of the different approaches between the consumer-and citizen perspective chosen by the researchers.

The sensitivity analysis led to relatively many respondents characterised as protestors and were removed from the analysis. A high rate of nonresponses could be harmful for the survey.

The WTP was elicited using a payment card. As discussed in the theory-section of this thesis, there are both advantages and disadvantages with this approach. One of these problems stem from which strategy to choose when eliciting the WTP from the payment card for further

analysis. This thesis chose the approach of selecting the midpoint between two monetary values on the payment card, as Cameron and Huppert (1989) suggested. Still, it is difficult to assure that this approach secures the best elicitation of the true WTP for the respondents. Measurement errors could materialize if choosing the wrong approach to this problem.

Both for the consumer perspective and the citizen perspective, the researchers introduced two different scripts, randomly distributed among the respondents. The purpose of these different script treatments was to examine demand effects in CV-studies. By using a Welch's t-test for comparing means with unequal variance, the objective of this part of the analysis was to examine whether there were significant differences between the two script treatments. A potential pitfall could materialize if incorrectly rejecting the null hypothesis. The difficulties in this thesis in regard to the divergence between the results obtained in the main analysis and the sensitivity analysis could lead to a type I or type II error, mistakenly rejecting the null hypothesis when it in fact is true (Stock & Watson, 2020).

6.1.3 Evaluation

I)   Are there significant differences between the standard script and the alternative script?

For the citizen perspective of the two surveys, it is not possible to conclude that there is a significant difference when controlling for the two script treatments, even at a 10 % significance level.

The consumer perspective (see table 6) provided a p-value of .056 and a |t|-value of 1.910 and is therefore nearly statistically significant at the 5 % level. With a 10% significance level, there is in fact a significant difference between the two scripts when respondents were asked to elicit their WTP for afforestation and take into consideration that their choices are consequential and could affect the climate. This is backed up by the one-tailed p-value of .028 indicating that the respondents stated a significantly lower WTP when presented with the standard script. We also observe that the mean WTP is considerably lower for the standard script with a mean of 626.597 compared to the alternative script with a mean of 788.475.

A similar result was found in the sensitivity analysis, where protestors were included. For the citizen perspective the analysis obtained a p-value of .473. However, for the consumer perspective a p-value of .033 and a corresponding t-value of 2.131 was obtained. By this we can conclude that the consumer perspective is statistically significant at the 5 % level in the conservative approach. Removing the outliers gave similar results. Also here a p-value of .053

indicates a significant difference between the script treatments for the consumer perspective, at least at the 10% level.

It is challenging to conclude firmly, as the p-value obtained in the consumer perspective is just above the threshold of a significance level of 5 % in the main analysis. However, by comparing the main analysis with the sensitivity analyses giving similar results, it is reasonable to conclude that there is a slightly significant difference between the two script treatments for the consumer perspective.

When inspecting the Welch's t-test in table 6, we observe that the mean WTP is considerably lower from the consumer perspective of the two surveys. The explanation for this is that the consumer version asked how much it is worth for the households to plant climate forest on half of the proposed area. Following this it should make sense that by doubling the means, it could correspond to the mean WTP for planting on the whole area. When doubling the means in the consumer perspective, we observe a mean of 1253.194 for the standard script, and 1576.95 for the alternative script. The first result is lower than the result obtained in the citizen perspective, standard script, with a mean WTP of 1308.318. However, by doubling the mean WTP for the alternative script I obtain a result that is considerably higher, compared to the citizen perspective, alternative script (mean of 1576.95 compared to a mean of 1238.74). This gives further weight to the conclusion that an alternative script, emphasizing the importance of the respondents to answer truthfully, does have an effect. It is however interesting that this is true only for the alternative script in the consumer perspective of the two surveys. It is not clear why this is the case.

One possible explanation could be that respondents make more well-considered choices when the situation is up to themselves and their households. Even though both situations (consumer and citizen perspective) clarified that the money spent on afforestation would need to be covered by a one-time fee from the households, it is possible that because the respondents in the consumer-perspective answered on behalf of their household, they did perform a better cost-benefit analysis, and therefore prioritized afforestation, compared to the alternative of letting the former pastureland grow naturally. Another possible explanation could be linked to the survey design. Afforestation on half of the area might be perceived as less comprehensive to digest, leading to a higher mean WTP. It would be interesting for further research to test the trends of such differences.

Another possible explanation regarding the differences might be due to spatial characteristics. The literature has shown that differences between urban and rural dwellers might affect WTP for ecosystem services (ES). Bergmann, Colombo and Hanley (2008) show that urban dwellers are more likely to be positive to ES. This might be especially true for the ES relevant for this thesis. The argument for planting climate forest is that it mitigates carbonization, compared to the argument of letting the pastureland reforest naturally. Most Norwegians live in cities and are affected by air pollution. Rural dwellers live closer to the pastureland in question and will probably benefit more from letting the areas grow naturally, as they are not as affected of air pollution. A threat to external validity would be if the composition of the populations between the surveys differs too much for instance in means of urban and rural dwellers. This could influence the results in this study.

Based on this analysis, it is reasonable to conclude that the alternative script in fact has an effect on the respondents. This is true for the respondents assigned to the consumer version of the surveys, being asked about their WTP for afforestation on behalf of their household. Script treatment might have a positive effect on CVM, especially when eliciting WTP from a consumer perspective, asking for the households' opinions.

6.2 Comparing the Norstat panel and the Citizen panel

6.2.2 Limitations of the survey and analysis

This analysis has been challenging in terms of data treatment ahead of analyzing. The data regarding the WTP elicitation for ES was compatible. However, the two surveys were conducted by different partners. Therefore some of the socioeconomic parameters were not consistent between the surveys, causing some difficulties regarding the descriptive statistics and data treatment. Only parts of the survey the Citizen panel respondents answered contained the climate forest parts relevant for this thesis. Problems with excluding the remaining respondents from the data without contaminating it could lead to problems regarding the internal validity of this analysis.

By comparing several studies that use internet surveys, Lindhjem and Navrud (2011) find that using the internet for conducting surveys might exclude responders. They find that internet surveys tend to have an overrepresentation of young, well-educated respondents with high income. The surveys in this thesis were conducted through the internet. This might cause exclusion of responders, which could lead to sample selection bias.

When gradually adding variables to the full sample comparison of the Norstat panel and the Citizen panel, the sample sizes decrease significantly (see table 10). Especially the Citizen panel has few observations. A small sample selection is undoubtedly negative for the analysis. Furthermore, in the sensitivity analysis the tobit regressions obtained a low chi-squared result in all but the full sample Citizen panel regression. This could indicate that the models suffer from heteroskedasticity (Stock & Watson, 2020). The same is true for the Pseudo R2, indicating a low degree of explanatory power. However, pseudo R2 increases when extending the model. This could indicate that when adding regressors the models fit better, and thus might cause model improvement (Wooldridge, 2018).

The caveats discussed here could threaten the validity of the analysis. However, the analysis still picks up interesting trends in the data, which is rewarding to discuss concerning the methodological issues relevant for this thesis. The regression including the Norstat-panel dummy as interaction terms gave output according to the robust censored tobit regression. This indicates that the independent variables added for this analysis still have a satisfying value in terms of interpretation.

6.2.3 Evaluation
II) To what extent are there significant differences for WTP for afforestation between the two survey panels, and if so, are there underlying motivations that could explain these differences when controlling for socioeconomic characteristics?

The following will discuss the empirical results obtained by comparing the mean total WTP between the two surveys. Furthermore, the section will provide possible explanations to the variables that has proven to be significant in the tobit model regression when controlling for socioeconomic assemblage between the two different surveys.

By conducting the Welch's t-test for comparing the WTP between the two surveys, I obtained a p-value of .436 with a corresponding t-value of .778. This gives firm weight to the conclusion that there is not a significant difference between the two surveys asking for the respondents WTP for afforestation. However, discussing the results obtained from the tobit regressions is still interesting. In the Norstat panel six variables that stood out. Several of the variables could be associated with underlying motivations. The *altruism* variable, asking the respondents if they were willing to give an amount between 0 and 10000 NOK to charity, was significant at the 1 % level for the first regression. The members of the Norstat panel assigned to the citizen version of the survey state a higher mean WTP compared to the respondents in

the Citizen panel. However, the members of the Citizen panel assigned to the consumer version state a higher mean WTP than the respondents in the Norstat panel (see table 5). The literature has shown that altruistic motivations have a positive effect on the stated WTP (Liebe, et al., 2011). The variable was however not significant for Citizen panel in any of the regressions. This could indicate that the members of this panel act more as consumers.

As discussed in the theory section of this analysis, the literature disagrees on whether there is a difference between "citizens" and "consumers" at all. Curtis and McConnell (2002) argue that the distinction between "citizens" and "consumers" does not exist. Their findings show that although some respondents were identified as having altruistic motives, their WTP did not differ from the others. This is opposed to Nyborg (2000) and Blamey et al. (1995), who claim that it is possible to distinguish between the two. Another study conducted by Ovaskainen and Kniivilä (2005) supports these results. Although the literature diverges in findings for the "citizen and consumer" hypothesis, it is vital to have in mind that none of the studies were conducted in entirely identical ways. Different studies assess different ES and does also use other assessment methods. Ovaskainen and Kniivilä (2005) for instance used a dichotomous referendum style survey, as opposed to the payment card approach in this thesis. These differences in research methods could materialize into different findings and emphasizes the importance of continued research on the topic.

The variables asking for the respondents reason for stating a WTP are both significant for the Norstat panel. *ClimateWTP* is significant at the 1 % level for both samples of the Norstat panel regressions. The *AltruisticWTP*-variable was added into the full sample Norstat regression and is significant at the 5 % level. This could suggest that the members of the Norstat survey panel are highly concerned with changes in ecosystem services (ES). This is more important for these respondents than for altruistic reasons, captured in the *AltruisticWTP*-variable. It could be discussed if caring for the environment could materialize from a sense of altruism. However, since this variable originated from the same question, the respondents could choose between altruistic reasons and environmental reasons. A less "ES-WTP" question could have led to another result.

Interestingly, the A*ltruistic_WTP* variable is significant in the Citizen panel when adding the panel member dummy variable as interaction terms on all explanatory dummy variables. This could indicate to some extent that also the members of the Citizen panel have underlying altruistic motivations.

The results obtained so far in this analysis gives an indication of the respondent's underlying motivations, making it reasonable to conclude that the members of the Norstat panel on average, act more as citizens, *Homo Politicus*.

The *Risktaking* variable is significant at the 5 % and the 10 % level in the Norstat regression and the Norstat full sample regression, respectively. In the surveys, the respondents were asked how willing they were to take risks, on a ten-point scale. It is not clear why this variable is significant for the Norstat panel regressions. Xu, Li, Li and Shan (2021) find that risk perception and environmental concern are correlated with policy and payment consequentiality i.e. the belief that what you say matters. In their study however, they asked for the respondents opinions on their belief for the risky outcome of the environmental problem. In this thesis the respondents were asked about their preference for risk in general. The cases are therefore not entirely comparable. The responders in the Norstat panel answer more surveys frequently and receive Norstat coins as an incentive. Also, these surveys are more related to consumer goods than is the case for the Citizen panel. Thus, this could point towards Norstat-responders taking more frequent and less well considered decisions than the members of the Citizen panel. A possible explanation to why the *Risktaking* variable is so significant in the Norstat panel survey but not in the Citizen panel survey could be that the Norstat respondents are less critical to the WTP questions and are more willing to spend money ruthlessly on different causes, and not necessarily just afforestation.

In the analysis the *Without_COVID* variable is significant at the 1 % level in the Norstat full sample survey but not in the full sample Citizen panel. In the survey the respondents were asked if they would state the same amount for afforestation in a situation without COVID. The negative coefficient in this variable indicates that an increase in this independent variable leads to a negative change in WTP. This indicates that the responders in the Norstat panel are less likely to report the same WTP when controlling for the pandemic. In the wake of the pandemic, the world experienced an economic crisis. Loureiro and Loomis (2017) find that WTP decreases when there is an economic recession. This research is consistent with the findings from the Norstat panel full sample regression in this dissertation.

The socioeconomic variable *Educationlevel* was significant only for the first Citizen panel regression. The literature disagrees about the importance of education in SP studies. Bonnichsen and Olsen (2016) find that education level does not influence the WTP for improved water quality in Denmark. Grimsrud et al. (2019) however find that respondents with a higher education level are more positive to introduce taxes on red meat and road toll as

means to reduce carbonization. A possible explanation to the lack of significance for the *Educationlevel* variable in this thesis could be related to the duality between the protection of biodiversity versus the reduction of carbonization by planting climate forest. The variable was only significant for the Citizen panel, and it could be that the members of the Citizen panel are more well educated, and therefore take more well considered decisions regarding the need for afforestation. An assumption here could be that their higher level of education gives better insight into threats to ES, and the lower WTP for afforestation compared to the Norstat survey panel could indicate that they value other means of protecting ES more. This could add weight to the results above since no other altruistic or environmental variables were significant for the Citizen panel survey.

It is surprising that income is not significant in any of the regressions. The reason for this is not apparent, as the literature agrees that income effects are important in CVM's. Liebe, et al. (2011) find that the level of income does not influence if the consumers will state a WTP, but by the amount they will donate it significantly influences the WTP. Lindhjem and Navrud (2011) and Xu et al. (2021) also find that income affects the amount of WTP reported. The result obtained here does however fit to the trends of the analyses that socioeconomic variables does not significantly affect the stated WTP.

Blamey et al. (1995) find that income effects could be interpreted in terms of class affiliation and can thus influence political preferences. The Citizen panel has a slightly higher education level on average compared to the members of the Norstat panel. It is reasonable to assume that these respondents have high income and probably have political preferences according to this. This is supported by the positive coefficients for the *PoliticalRight* variable in the Citizen panel regressions. Furthermore, Blamey et al. (1995) argue that respondents in CV surveys might express social and political attitudes, rather than economic consumer preferences. Mahler (2017) and Russel, Bjørner and Clark (2003) find that altruism matters when voting. They find that voters taking a benevolent altruistic approach leads the voters more to the political left. In the regressions attained above, the coefficient for the Norstat responders is negative, indicating a left-oriented political approach to the WTP-question. The variable is also significant at the 10 % level in the Norstat panel full sample.

Furthermore it is interesting to observe that the variable *Under50years* is not significant, as previous research has shown that younger people tend to evaluate ES protection as more important than the elder (Blamey et al., 1995), (Xu et al., 2021) and (Hindsley & Ashton Morgan, 2022). A potential disadvantage with the current analysis is that the age variable is

binary coded with respondents above and below 50 years of age. This might lead to dispersion in the distribution of age, causing threats to the validity of this variable in the analysis.

Anduiza and Galais (2017) study screeners or instructional manipulation checks (IMC) in online surveys. These checks are often included in surveys to prevent respondents choosing random responses. They find that education and intrinsic motivation reduce the probability of failing such checks. They also find that material awards used as an incentive does not necessarily lead to poor responses. Additional literature supports these findings (Singer & Ye, (2013) and Matthijsse, desiree de leuw, & Hox (2015)). Similar results could be translated to this analysis. A majority of the respondents are well educated, and as discussed above, many of them could be voting for altruistic reasons. Furthermore, the members of the Norstat panel are incentivised by earning Norstat coins. This does not necessarily mean that they are more prone to consumer-related characteristics, and are careless to the surveys they participate in. The respondents in the Norstat survey have the option of donating the Norstat-coins they receive to charity (Norstat, n.d.). It is possible that many of the respondents choose to give their received coins as a donation. This could be a possible explanation to why the variables indicating underlying altruistic motivations are significant for the Norstat panel in this analysis.

As the mean total WTP when comparing the two surveys are not significant, the differences between the two panels are not comprehensive. However, the results obtained in the tobit regression in this analysis could indicate that the members of the Norstat panel do have underlying motivations and act more like citizens (*Homo Politicus*) compared to the members of the Citizen panel. This is especially true for the respondents assigned to the citizen perspective in the Norstat survey panel, with higher mean WTP.

There could be several underlying explanations for the differences between the Norstat panel and the Citizen panel. One explanation could be related to demand effects or respondent fatigue, as discussed in the theory section of this paper. The members of the Citizen panel answer fewer surveys each year compared to the Norstat members. Even though the surveys relevant for this thesis had questions on important environmental issues, the Norstat panel also respond to many surveys related to consumer goods. On the other side, the Citizen panel surveys are much longer, and respondents may lose focus. This may be true even though the WTP for afforestation-questions were placed early in this survey. Whether the answers in the surveys have been influenced by respondent fatigue is not clear in this analysis. Furthermore, it is possible that the members of the Norstat panel are more prone to demand effects, where

the respondents here give answers they think falls in line with the goals of the researcher (Mummolo & Peterson, 2018). These problems of hypothetical bias highlight the importance of future research focusing on these problems in SP studies.

The results obtained in this thesis do not necessarily mean that the members of the Citizen panel are more sceptical to the consequences of climate change. The two surveys contained questions that attempted to elicit the WTP for afforestation. This measure of protecting ES is not straight forward. Afforestation is beneficial in terms of carbon sequestration. However, the biodiversity is largely affected. This duality was firmly illuminated. It is reasonable to assume that the respondents have taken this into consideration. The relatively low mean WTP regardless of survey belonging and script version the respondents were assigned to, could indicate that the respondents valued protection of biodiversity equally high. The opposite directions on the environmental means highlighted in the surveys might have neglected the afforestation part. This is backed up by the missing significance of the *Climateconsequence* variable in both surveys.

Based on the analyses conducted in this dissertation, the mean total WTP between the surveys does not differ significantly. However, several important characteristics stand out in the Norstat panel regressions. This indicates that underlying motivations do matter in contingent valuation (CV) studies. In the analyses conducted here, this is especially true for the members of the Norstat panel.

6.3 Conclusion

This thesis has investigated methodological issues with CV methods for ES in Norway. The first issue is related to whether differences in the formulation of WTP questions with different scripts can cause significantly bias in CV surveys. It is important to obtain a better understanding of this potential problem as the literature has shown that demand effects in stated preference studies are common. Problematic demand effects could be erased if the WTP questions are formulated in a way that emphasizes the importance that the respondents answer their true WTP. The second methodological issue studied in this thesis is to what extent there are significant differences for WTP for afforestation between the Citizen panel and the Norstat panel. This thesis has attempted to examine whether such differences might arise due to underlying motivations, when controlling for socioeconomic differences in the assemblage of respondents. Understanding the motives of CV survey respondents is vital to the task of discussing the legitimacy of such studies (Curtis & McConnell, 2002).

The thesis is based on surveys conducted by Norstat panel and the Norwegian Citizen panel during the spring of 2020. The surveys mapped the Norwegian populations' WTP for climate forest planting on abandoned pastureland.

Although several caveats have been highlighted in this thesis, there are interesting results that should be thoroughly assessed in future research. Comparing different script treatments in the analyses has revealed that an alternative script focusing on reducing "social desirability bias" might have an effect. This is especially true when conducting CV surveys focusing on the consumer, asking for the households WTP.

The second part of the analysis compared the mean total WTP between the two survey panels consisting of different assemblage of respondents. This analysis has shown that the socioeconomic differences between the two panels were not comprehensive. However, underlying motivations could influence the WTP for environmental goods. In specific, environmental attitudes and altruistic motivations do have an effect on the valuation of ES. This is in line with the literature, see for instance Liebe et al. (2011) or Blamey et al. (1995). Controlling for these effects in the valuation of ES services could improve the estimation of consumers welfare in CV studies.

A fruitful extension of this analysis might be to do a re-test of the survey, as suggested by Champ et al. (2017). Future research could benefit from analysing demographic differences between respondents. This might influence the results, as research has shown that WTP for ES depends on whether the respondents are emotionally connected to the area, or frequently use the area in question (Grimsrud, Graesse, & Lindhjem, 2020). Furthermore, analysing time consumption during CV surveys might add weight to an analysis, in order to determine how serious the respondents take the surveys. Finally, conducting the surveys by other methods than through the internet might include elder, less educated and people with lower income, which could prove to mitigate bias in future studies.

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8. Appendix

Figure 4) Alternative script, including "cheap talk", from consumer perspective

What is your opinion on forest planting?

The authorities are now considering whether, and if so, how much afforestation should be carried out. The forest planting will be evenly distributed in the possible areas in different parts of the country. Imagine that afforestation will have to be covered by a one-time fee that is equal for all Norwegian households.

How much do you think society should spend on forest planting?

Your answers are important and will be taken into consideration in regard to afforestation-treatment.

Why is your opinion important?

In this survey, it is important that you consider what you think society should do. You should also consider what your and other households may be willing to pay, if any, for afforestation. Afforestation is one of several possible climate measures, and Norway has also other environmental goals to take into account. Remember that we want your opinion on what society should do, not the experts'.

There is no right or wrong answer, as long as you answer what you mean. Ask yourself: Do I think there is enough uptake of greenhouse gases in the vegetation as it is, or do I think we should invest in afforestation measures?"

Mark on the scale the highest one-time fee, if any, the authorities should impose the households such that forest planting can be financed. If your household prefer no planting, choose 0.

The higher amount you state, the more trees will be planted. However, every household will have less money to spend on other things.
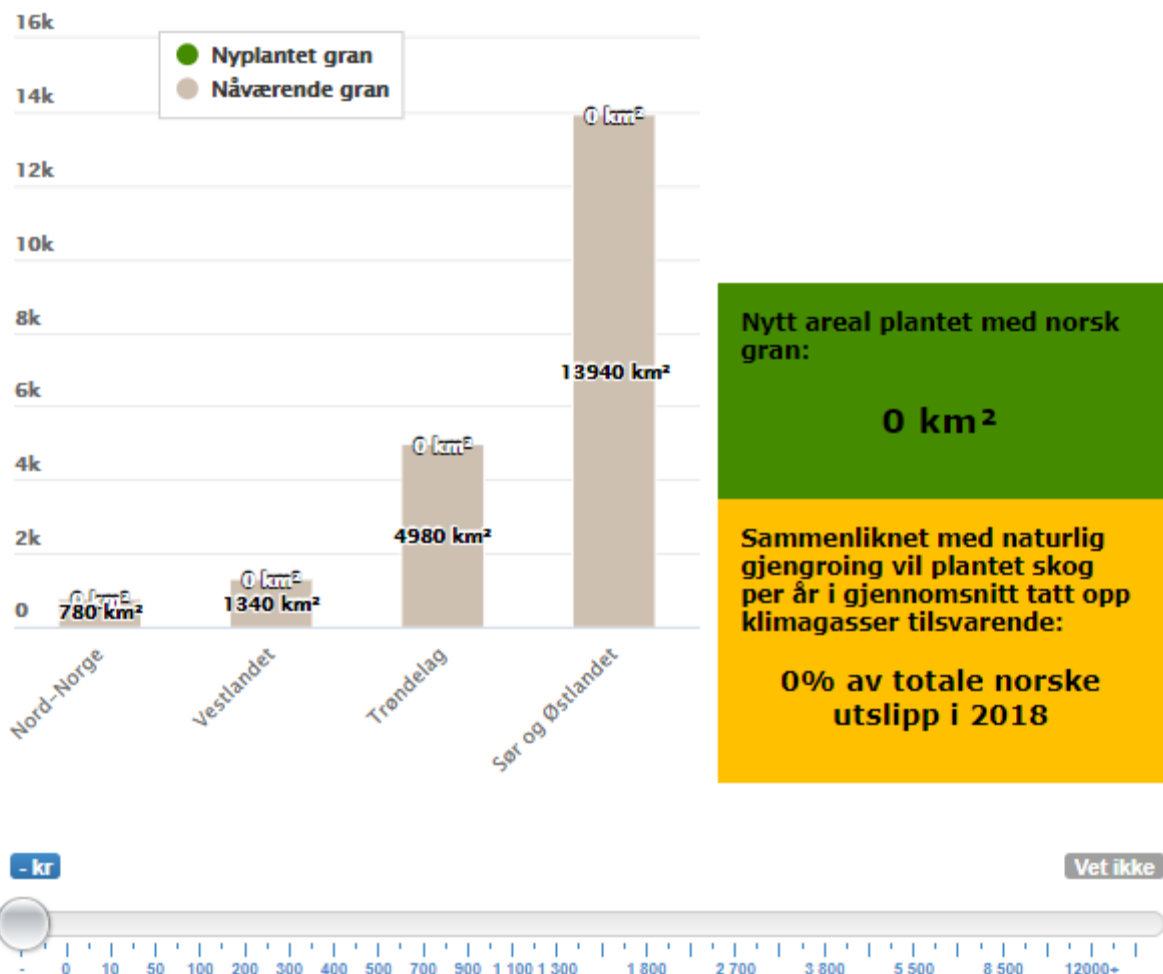
Figure 5) Most important reason for WTP

Most important reason for WTP

- The positive effect on the environment, even though it can be negative for the landscape
- The positive effect on the environment, even though it can be negative for plants and animals
- I normally contribute to these types of causes
- It gives me pleasure to contribute to these types of causes
- The climate impact for future generations
- Contributes to work in the districts
- Other reason, pleace specify
- Unsure/don't know
- Not answered

Figure 6) Reason for stating zero WTP

Reason for stating 0 WTP

- What I say will not affect whether measures will be carried out or not
- I don't believe the climate damages are significant
- I believe fees and taxes are high enough already
- I believe other climate measures will have a better effect
- I believe the basis of knowledge is not sufficient enough to prioritize this
- My household can not afford to pay for this
- Other reason, pleace specify

Figure 7) Reason for stating "don't know" WTP

Table 12) Tobit regression, outliers excluded

Dependent variable: ln(WTP_Tot+1)

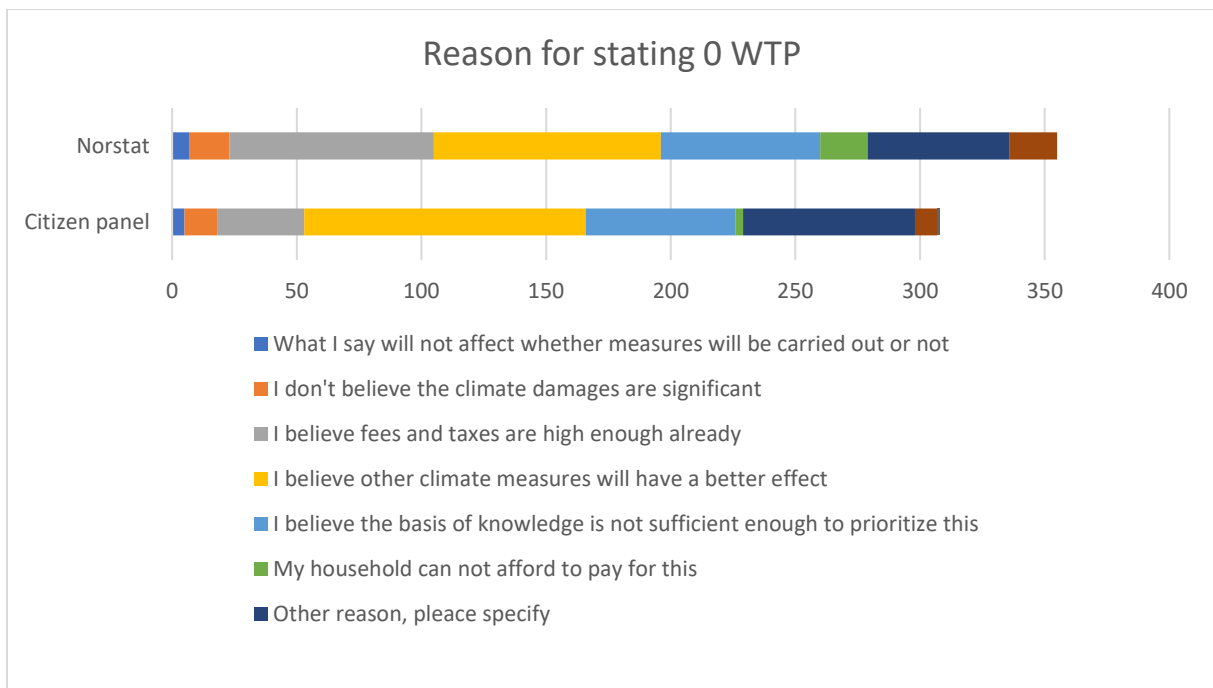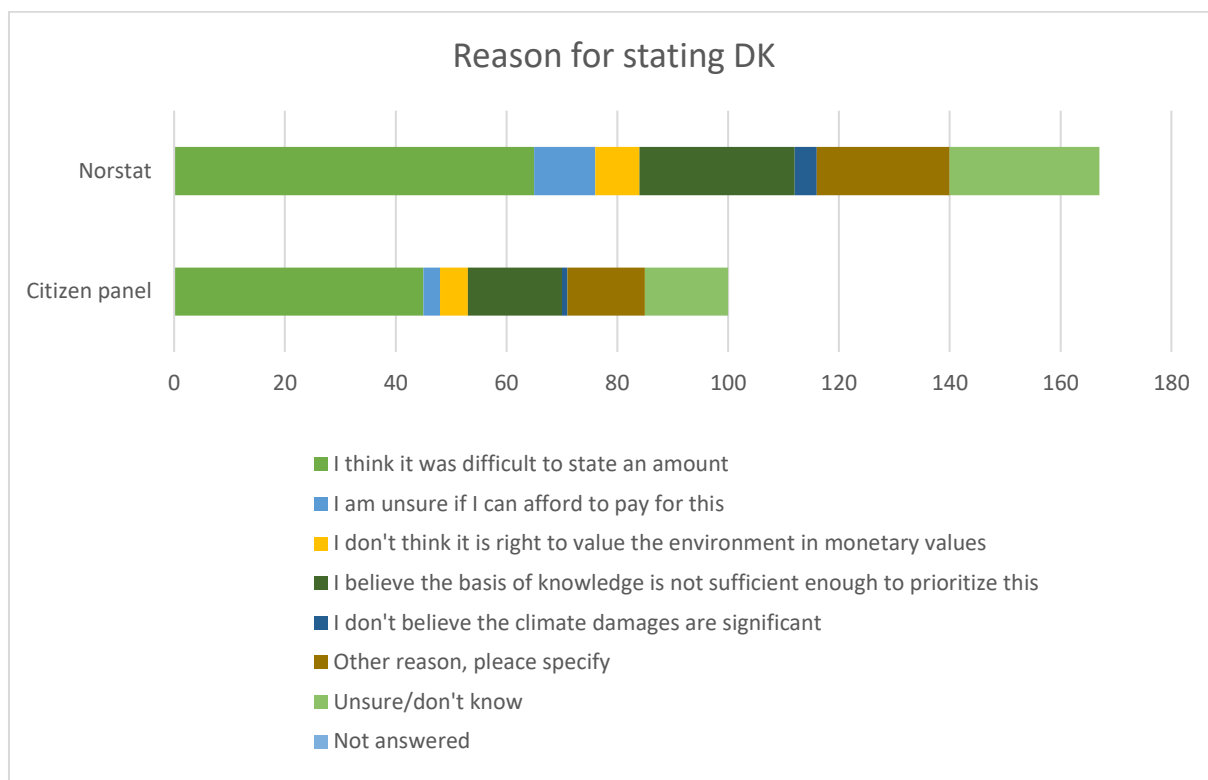|	(1) Norstat panel 1	(2) Norstat panel 2	(3) Citizen panel 1	(4) Citizen panel 2
Log of altruism	0.0553*** (0.0157)	0.00830 (0.0300)	0.0355 (0.0254)	-0.0397 (0.0649)
Male	0.180 (0.107)	0.134 (0.209)	0.0990 (0.190)	0.386 (0.317)
PoliticsRight	-0.227* (0.112)	-0.409* (0.201)	0.255 (0.175)	0.294 (0.490)
Climateconsequence	0.101 (0.149)	-0.362 (0.300)	-0.336 (0.313)	-1.657 (0.902)
Climate_WTP	0.693*** (0.135)	1.867*** (0.366)	0.555 (0.305)	-0.986 (1.695)
Risktaking	0.365** (0.125)	0.470* (0.217)	0.250 (0.214)	0.357 (0.563)
Goodmath	0.144 (0.112)	-0.102 (0.204)	0.168 (0.196)	-0.712 (0.508)
Motivation_reason	0.00449 (0.117)	0.0822 (0.220)	0.0338 (0.424)	1.173 (0.642)
Log of income	0.0118 (0.0129)	0.0110 (0.0229)	0.0165 (0.0435)	0.0440 (0.0608)
Educationlevel	-0.0184 (0.114)	0.0123 (0.220)	0.487* (0.205)	0.888 (0.481)
Without_COVID		-1.255***		0.195

	(0.315)		(2.258)
Altruistic_WTP	1.323**		-3.294
	(0.417)		(2.198)
Coronafund	0.309		0.603
	(0.208)		(0.540)
Online_surveys	-0.0117		0.535
	(0.261)		(1.107)
Under50years	0.121		0.297
	(0.220)		(0.475)
Constant	5.083***	5.252***	4.735***	4.389
	(0.233)	(0.510)	(0.745)	(2.210)
Var(lWTP_Tot)	2.669***	2.374***	2.421***	2.008***
	(0.136)	(0.231)	(0.232)	(0.447)
N	935	266	314	49
Pseudo R2	0.019	0.056	0.025	0.080

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13) Tobit regression, Norstat=1 (Citizen panel) as interaction term

Dependent variable: ln(WTP_Tot+1)	(1) lWTP_Tot
laltruism	-0.000185
	(-0.01)
Male=1	0.133
	(0.64)
Norstat=1	-0.733
	(-0.36)
Male=1 X Norstat=1	0.296
	(0.80)
PoliticsRight=1	-0.412*
	(-2.06)
PoliticsRight=1 X Norstat=1	0.820
	(1.59)
Climateconsequence=1	-0.356
	(-1.19)
Climateconsequence=1 X Norstat=1	-1.290
	(-1.30)
Without_COVID=1	-1.258***
	(-4.01)
Without_COVID=1 X Norstat=1	1.486
	(0.65)
Altruistic_WTP=1	1.318**
	(3.17)
Altruistic_WTP=1 X Norstat=1	-4.695*
	(-2.08)
Climate_WTP=1	1.859***
	(5.11)
Climate_WTP=1 X Norstat=1	-2.919
	(-1.63)
Coronafund=1	0.334
	(1.63)

Coronafund=1 X Norstat=1	0.244
	(0.46)
risktaking=1	0.475*
	(2.19)
risktaking=1 X Norstat=1	-0.133
	(-0.22)
Goodmath=1	-0.0913
	(-0.45)
Goodmath=1 X Norstat=1	-0.618
	(-1.13)
motivation_reason=1	0.0828
	(0.38)
motivation_reason=1 X Norstat=1	1.143
	(1.63)
online_surveys=1	-0.00925
	(-0.04)
online_surveys=1 X Norstat=1	0.579
	(0.51)
lincome	0.0130
	(0.59)
educationlevel=1	0.0183
	(0.08)
educationlevel=1 X Norstat=1	0.853
	(1.74)
under50years=1	0.117
	(0.54)
under50years=1 X Norstat=1	0.209
	(0.41)
Constant	5.253***
	(10.44)
Var(lWTP_Tot)	2.315***
	(11.20)
Observations	316
Pseudo R2	0.059

t statistics in parentheses
$^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$