Hypothetical bias and certainty calibration in a value of time experiment

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Abstract

This study is the first to analyze hypothetical bias in a willingness to pay for time context as well as the first to test certainty calibration of the value of time. Hypothetical and real actions are compared in an experimental setting where the subjects are given an offer to leave the experiment in advance by paying a given amount of cash. The results show a weak tendency of positive hypothetical bias in the willingness to pay for value of time, though this effect is not different from zero at conventional significance levels. However, certainty calibration, by using the information from a follow-up question where the subjects are self-stating their preference certainty of their hypothetical choice, provides evidence of a significant positive hypothetical bias for non-certain subjects whereas this bias is eliminated for certain subjects.

Keywords: Value of time; Hypothetical bias; Certainty calibration; Preference certainty
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1 Introduction

During the last decades, stated preference (SP) techniques have become an increasingly used method to value goods were no market price is available. Better

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computational resources, the opportunity to set relevant scenarios, and problems with, or even absence of, revealed preference data are all characteristics that works in favor of SP techniques.

Nevertheless, there are shortcomings of SP methods as well. The main criticism is the prominent risk of hypothetical bias caused by the fact that individuals tend to act differently in a real context compared to their statement in a corresponding hypothetical context. Harrison (2006) argues that this is the main problem to consider when SP data is used. Consequently, the hypothetical bias has been the focal point of a large number of studies in different fields wherein this type of bias usually is found to be positive and also in many cases large (e.g. Cummings et al., 1995; List and Gallet, 2001; Murphy et al., 2005). In addition, Venkatachalam (2004) provides a good overview of studies of hypothetical bias.

These studies, however, either value public goods, for example environmental improvements, or value private goods where the demand is derived from a utility maximization problem that has only one constraint, namely a budget constraint. If the budget constraint is not fully considered when individuals are making hypothetical choices, any hypothetical bias is per definition positive.

Considering the value of time (VOT), there are only a few experimental studies of hypothetical bias and the result is quite different from the result in other fields. Studies like Brownstone and Small (2005), Ghosh (2001), and Isacsson (2007) all find a negative hypothetical bias meaning that VOT is higher in a real context than in a hypothetical context. A possible explanation for these

seemingly surprising results is that a utility maximization problem to derive VOT has not only a budget constraint but also a time constraint. A hypothetical decision of the trade-off between time and money does not cost anything neither in terms of time nor in terms of money and given that individuals in a hypothetical treatment do not experience these constraints to be binding, the two constraints will cause hypothetical bias in different directions. The sign of the hypothetical bias is then determined by the effect that dominates which is an empirical question that, in the studies cited above, resulted in a dominating time constraint. This result has been explained by scheduling constraints meaning that individuals already have devoted their time to other activities which can not be changed at short notice and this is not completely considered when hypothetical choices are made.

In this paper, there are two main objectives. The first one is to test the existence of hypothetical bias in the willingness to pay (WTP) for VOT in an experimental setting where no scheduling constraints occur. This scenario is created by recruiting students as subjects where they got the prior information that the experiment will take one hour and that they will receive a cash compensation of 100 Swedish Crowns (SEK) (approximately 10.50 EUR) after their participation in the experiment. During the experiment, the subjects are given an offer to leave the experiment in advance by paying a certain amount of cash. The sample is randomly assigned into two sub samples where one of them is given a real offer and the other is given a hypothetical offer. By assuming that the reference point when the subjects are given the offer is that they would receive 100 SEK after completion of the one-hour experiment, this

offer is measuring the WTP for time. Note also that, since all subjects have accepted the one-hour experiment, there is no scheduling constraint in this experimental approach.

As the second objective, the method of certainty calibration to eliminate or reduce any hypothetical bias is tested by asking a simple follow-up question about the self-stated preference certainty to the subjects of the hypothetical group. This method has not been applied to a VOT experiment before but has been found to succeed as a calibration method to eliminate hypothetical bias in stated preference studies in other fields (e.g. Blumenschein et al., 2008; Champ et al., 1997; Johannesson et al., 1998).

The issue studied in this paper is policy relevant since VOT usually is the largest benefit of investments in transport infrastructure (Hensher and Brewer, 2001, note that more than 70 percent of total user benefits in many transport investments correspond to travel time savings). A biased VOT in cost benefit analysis may imply that resources are not used in the optimal way, which would be a contradiction to the policy objective of efficiency in the transport sector.

2 Previous research

Brownstone and Small (2005) summarize different stated preference (SP) and revealed preference (RP) studies carried out at two different highway routes in California. In the quasi-experimental setting drivers have the opportunity to use a tolled lane of the highway to avoid congestion and, consequently,

experience a shorter travel time.

From both highway routes, the results of Brownstone and Small (2005) are robust and show that VOT in the RP context is approximately twice as large as VOT in the SP context. This difference is interpreted as a scheduling constraint that the drivers face when they make a real lane decision in the car but is not in their mind when they make a hypothetical lane decision. This means that when the real decisions are made the time constraint is relatively more important than the budget constraint. Hence, any difference between real and hypothetical choices is more affected by the time constraint than by the budget constraint with the result that the hypothetical bias is negative.

Another study that uses two experiments to compare real and hypothetical VOT is Isacsson (2007). In the first experiment, the last 15 minutes of a lecture at a college in Sweden were devoted to a questionnaire that the students answered on a voluntary basis. When the lecture ended, the students were given an offer to receive a monetary compensation for staying another 15 minutes and answer one more questionnaire, which implies that the estimated VOT is in the willingness to accept (WTA) context. The students were randomly assigned into two groups; one that was given a real offer and another that was given a hypothetical offer. The result shows that average real VOT is about twice as large as average hypothetical VOT, which supports the result of Brownstone and Small (2005) for a different type of time context. The similarity between both these studies is that the interpretation of the result is scheduling constraints. An argument for this interpretation in Isacsson (2007)

is that the size of the offered monetary compensation did not influence the fraction of the students that accepted the offer in the real treatment, which can be interpreted as "either I have the time or I have other plans for this time regardless of the compensation". In addition, another argument is that an estimation in Isacsson (2007) where the effect of scheduling constraints at this particular time is eliminated shows a real VOT that is not significantly different from hypothetical VOT. In fact, the tendency in this estimation is more like a positive hypothetical bias.

The second experiment of Isacsson (2007) was a quasi-experiment where students, at the same college in Sweden, that were going to participate in a lecture in a nearby town were offered two different buses where one bus was both slower and cheaper than the other one. Since all students actually needed a bus, control groups for the hypothetical treatment were created by a matching technique. Also in this experiment, the result shows about twice as large average VOT in the real group compared to the hypothetical group. Since the subjects chose the bus a few days before the trip actually took place, scheduling constraints seem to not be a factor as important in this case as in both the WTA experiment of Isacsson (2007) and Brownstone and Small (2005). Still, the hypothetical bias is found to be negative.

Smith and Mansfield (1998) do not find evidence of hypothetical biased VOT in an experiment where subjects in a telephone survey were given an offer of a monetary compensation for participating in another survey later on, i.e. an offer in the WTA context. Their interpretation of the result is that both

treatments experience the offer as real, which could be seen as support for the use of SP techniques to value non-market goods. The main focus of the study, however, is to compare the result with studies of hypothetical bias in other fields where this type of bias mostly is found to be positive and severe. Nevertheless, Smith and Mansfield are not pointing out the specific feature of VOT with both the budget and time constraints that are expected to affect any hypothetical bias in different directions. In addition, there was no binding agreement for the subjects of the real treatment and those who accepted the offer could not be forced to actually participate in the survey when it would be carried out. Furthermore, the private time that the researcher wanted to buy for survey purpose was unspecified to some time in the future. Hence, the constraints were not binding even in the "real" treatment wherefore no scheduling constraints occurred in this experiment. If the "real" group would have made a real choice with no opportunity to regret it, i.e. with constraints that actually bind, the result may have been different. My interpretation of the result in Smith and Mansfield (1998), thus, is that both treatments tend to experience the offer as hypothetical leading to the different result compared to Brownstone and Small (2005) and Isacsson (2007).

What result is then expected when the discrepancy between real and hypothetical VOT is studied in a WTP context without scheduling constraints? First, if scheduling constraint is the true explanation for the results in Brownstone and Small (2005) and Isacsson (2007) there is no compelling reason to expect the same result in this study. A more likely expectation in this case may be a result that goes the other way around, which is also partly supported

by the result in the WTA experiment of Isacsson (2007) where the effect of scheduling constraints is eliminated from the estimated VOT. This means, in other words, that the effect of the non-binding constraints in the hypothetical treatment may be almost unimportant for the time constraint when scheduling constraints are not under discussion. The only constraint that may cause a difference between hypothetical and real treatment is then the budget constraint. Hence, the result may be a positive hypothetical bias in this study as in most hypothetical bias studies of WTP for private goods.

On the other hand, the quasi-experiment with bus choices in Isacsson (2007) give some evidence of a higher real VOT than hypothetical VOT in a context where scheduling constraints should play a minor role. Hence, the expected result of this study is ambiguous, which also is an important motivation for the experimental approach used.

2.1 Certainty calibration

The method of certainty calibration by using information of self-stated preference certainty from a follow-up question has been found to eliminate or mitigate the problem with hypothetical bias in other studies (e.g. Blumenschein et al., 2008; Champ et al., 1997; Johannesson et al., 1998). Basically, there are two types of follow-up questions that have been used; a ten grade scale where the subjects are asked to state their certainty (e.g. Champ et al., 1997), and binary qualitative alternatives for the certainty (e.g. Blumenschein et al., 2008).

Furthermore, different methods of how to deal with the certainty information in the empirical analysis exist. There are studies that exclude all uncertain subjects (e.g. Hultkrantz et al., 2006; Svensson, 2006) and studies where the uncertain yes-responders are recoded as no-answers (e.g. Blumenschein et al., 2008). For studies using a certainty scale, the cut-off point where a hypothetical yes have to be treated as a certain yes to correspond to a real yes also varies across studies. Most common is a cut-off point of ten (e.g. Champ et al., 1997) or a cut-off point of eight (e.g. Champ and Bishop, 2001). Finally, other studies try to incorporate the certainty answer into the estimation through different variable recoding approaches (e.g. Loomis and Ekstrand, 1998).

3 Experimental design

The experiment was carried out between 4:15 and 5:15 p.m. on April 22, 2008 at the main campus of the Royal Institute of Technology (KTH) in Stockholm, Sweden. 160 students voluntarily participated in the experiment with the following prior information; the experiment would be carried out at this given time and last for exactly one hour, they would receive a cash compensation of 100 SEK (approximately 10.50 EUR) immediately after the experiment, the experiment would consist of a series of questionnaires, an experimental setting were required to secure the order the subjects answered the questionnaires, and that there would be no interaction between the participants in the experiment.

In the recruiting process, I visited a large number of lectures at KTH and

Stockholm University (SU) to inform about the experiment. Interested students received an information note that stated all conditions for the experiment as well as that the students would send me an e-mail if they were interested in participating. In addition, I also put up information notes on bulletin boards around the campuses of KTH and SU.

In total, 168 students were announced to participate when the experiment started. Hence, only 8 students did not show up, whereof at least two students arrived to the experiment too late to participate.

The experiment started with brief information and then the subjects answered a questionnaire about personal characteristics followed by a questionnaire about their attitudes to security issues in public transports. Up to here, the experiment was carried out equally for all subjects.

When the experiment had lasted for exactly 10 minutes, a paper-written offer to pay a certain amount of cash to leave the experiment with 45 minutes to go was given to the subjects. The subjects were randomly assigned into six different rooms at this KTH campus, wherein three of the rooms, the treatment of the offer was real and in the other three rooms the treatment of the offer was hypothetical. The offer prices were the same within a given room and varied between a price of 10, 30, and 50 SEK. This means an hourly offer price of time that corresponds to 13.33, 40, and 66.67 SEK respectively. In the question, there was also stated that this cash payment, given acceptance of the offer, would be reduced from the predetermined cash compensation of 100 SEK. In Appendix, the formulations of these paper-written offers are presented in a

version freely translated from Swedish.

This procedure may cause the objection that this is not a WTP context based on the argument that the reference point is ambiguous. However, given that the predetermined cash payment of 100 SEK should be accounted for by the subjects when they are making their choice to accept the offer or not, the offer is in the WTP context. Furthermore, the word "pay" is consequently used to emphasize that there is a monetary cost of accepting the offer. There was also explicit information about this procedure to compensate the participants with 100 SEK in cash after the one hour experiment both when the students were recruited and in the beginning of the experiment. To accept the offer would necessarily mean less received money and more time to spend on other activities than the reference decision to participate in the experiment. Referring to these arguments, the offer in this experiment is regarded as a WTP offer. Note, moreover, that there is no scheduling constraints but still a binding budget constraint in this experiment, which make this approach unique among the experimental analyses of hypothetical bias of VOT.

One further motivation to use this approach and not hand out the money in the beginning of the experiment was to get rid of the risk that someone would leave the experiment in advance but not paying the monetary cost. With this approach, no participant had the incentive to cheat in the experiment.

The subjects were asked to make their choice by circle the answer to avoid the problem that subjects might follow others in their choice. After the choice was made, those in the real treatment that accepted the offer received their

cash. Those subjects remaining in the real treatment and all subjects in the hypothetical treatment continued to answer two more questionnaires during the rest of the experiment and, finally, they received the predetermined cash compensation of 100 SEK.

3.1 Certainty calibration

This experiment is the first to test the method of certainty calibration in a VOT context. Subjects of the hypothetical group were given a follow-up question where they were asked about how certain they are that they would have made the same choice if the treatment would have been real and not hypothetical. Two qualitative alternatives were available; "yes, completely certain" and "no, not completely certain". This approach is inspired by Blumenschein et al. (2008), where certainty calibration was found to eliminate the hypothetical bias of the WTP for a private good. In addition, I do not use the, in the literature, more frequently used ten grade scale for the preference certainty with the motivation that such a scale make it ad-hoc for the researcher to decide which stated certainty values to treat as certain. Instead, with only two alternatives, there is only one possible coding of the certainty.

Note that the subjects did not know about this follow-up question when they made their hypothetical choice. Hence, there is no risk that the mere existence of a preference certainty question will influence the hypothetical choice and, thus, also the test of hypothetical bias. This approach is preferred to increase the accuracy of this method according to Blumenschein et al. (2008).

In Appendix, the formulation of this follow-up question is presented.

4 Results

It is important for the reliability of the result that the real group and the hypothetical group are analogous with respect to their characteristics, wherefore a random assignment of the subjects into each treatment was used. Descriptive statistics of socio-economic variables divided into treatment and offer price are presented in table 1. These variables are defined in the following way; *Age* is the age of the subject given in years, *Female* is a variable indicating that the subject is a woman, *Cohabitant* is a variable indicating that the subject is married or cohabitant, *Income* is the subject's net income in SEK per month, and *Univ1sem* is a variable indicating that the subject has completed at least one semester of university studies.

[Insert table 1 about here]

To test whether there are significantly different variable means across the real treatment and the hypothetical treatment, two-tailed t-tests are used. In total, 20 different tests are performed, whose p-values also can be found in table 1. At the ten percent level, two tests are significant; *Age* for offer = 50 and *Cohabitant* for offer = 30. Two significant tests out of 20 at the ten percent level are exactly what is expected given that the assignment into real and hypothetical treatment is random. Furthermore, one of these tests, *Age* for

offer = 50, is significant at the five percent level. This is also according to the expectation given a random assignment. Hence, there is no reason to believe that the two treatment groups can be viewed as systematically different with respect to their characteristics.

In table 2, the number of subjects that is accepting the offer at different prices is presented. There is a weak tendency that more subjects in the hypothetical treatment did accept the offer. However, tests whether different proportions accept the offer across the different treatments are not significant regardless if the offer prices are pooled or treated separately. Note that these tests are not the conventional parametric tests of equal mean values (t-test or χ^2-test). Instead, Fisher's exact test is used with the motivation that the data used is unbalanced and asymptotic methods tend to produce unrealistic results in these cases (Fisher, 1935).

[Insert table 2 about here]

The probability of accepting the offer may also depend on other variables than treatment. Hence, a discrete choice model is estimated and in this case, instead of one of the more conventional logit or probit models, a complementary log-log model is used. The reason is that this model is asymmetric around zero and is therefore preferred when one of the outcomes is rare (see Cameron and Trivedi, 2005, p. 466). The complementary log-log model is defined as follows

$$Pr(\text{accepting offer}|\mathbf{x}) = 1 - \exp(-\exp(\mathbf{x}'\beta)), \tag{1}$$

where in this application

$$\mathbf{x}'\beta = \beta_0 + \beta_1 Offer + \beta_2 Hypothetical + \beta_4 Age + \beta_5 Female$$
$$+ \beta_6 Cohabitant + \beta_7 Income + \beta_8 Univ1sem.$$

In table 3, the results of the estimated complementary log-log model on all 160 observations are presented. As can be seen, the offer price is negative and significant at the five percent level meaning that the expected and satisfying properties of a downward sloping demand curve for time holds also in this stylized setting. Furthermore, the estimated effect of the hypothetical treatment is positive with a p-value of 0.21, which implies that this hypothetical bias is not different from zero at conventional significance levels. Nevertheless, this result can be viewed as a weak indication that the probability of accepting the WTP offer may be higher in the hypothetical context than in the real context which, in its turn, would imply a positive hypothetical bias. No other control variables in this estimation are significant.

[Insert table 3 about here]

To test the method of certainty calibration, i.e. how the information of the preference certainty follow-up question influences the difference between real and hypothetical choices, the number of accepted offers are compared between,

on the one hand, real and certain hypothetical subjects and, on the other hand, real and non-certain hypothetical subjects. Also here, the difference of the proportions that accept the offer across the groups is tested with Fisher's exact test and the tests are only performed for the pooled sample including all offer prices. The results of these tests, presented in table 4, show that there is a tendency of a positive hypothetical bias for the non-certain hypothetical subjects since the p-value is about 0.11. For the certain hypothetical subjects, however, there is no indication at all of a hypothetical bias.

[Insert table 4 about here]

To incorporate the information of the preference certainty follow-up question in the model where other covariates are allowed to influence the probability to accept the offer, a variable indicating a "yes, completely certain" response to the follow-up question, *Certain*, is included in the complementary log-log model. In this case $\mathbf{x}'\beta$ of model (1) is given by

$$\begin{aligned}\mathbf{x}'\beta = \beta_0 + \beta_1 Offer + \beta_2 Hypothetical + \beta_3 Certain + \beta_4 Age \\ + \beta_5 Female + \beta_6 Cohabitant + \beta_7 Income + \beta_8 Univ1sem.\end{aligned}$$

Here, the effect of the hypothetical treatment is allowed to be different for non-certain and certain subjects. β_2 is this effect for non-certain subjects while $\beta_2 + \beta_3$ is this effect for certain subjects.

The results of this estimation are presented in table 5. A good outcome is that

the offer price still is negative and significant at the five percent level. More interesting, though, is that the effect of hypothetical treatment is positive and significant at the five percent level for non-certain subjects whereas this effect is eliminated for certain subjects. Hence, this estimation indicates evidence of a positive hypothetical bias for non-certain subjects but no difference in the probability to accept the offer between certain hypothetical subjects and real subjects.

[Insert table 5 about here]

5 Discussion

This paper is the first study that analyzes hypothetical bias of value of time (VOT) in an experimental willingness to pay (WTP) context. Also, this is the first study to test the method of certainty calibration in a VOT experiment.

The results show a weak tendency of a positive hypothetical bias but this effect is not different from zero at conventional significance levels. However, when the information of a follow-up question of preference certainty is used in the estimation there is support for a positive hypothetical bias for non-certain hypothetical subjects whereas no hypothetical bias is found for certain hypothetical subjects. This is the most important result of this study and also a corroboration of the finding of studies in other fields where the method of certainty calibration through a follow-up question is successful to eliminate or mitigate the problems with hypothetical bias.

The experimental setting in this paper is nearest to the approach of Blumenschein et al. (2008) where the similarities include; valuing a private good, a WTP context, a qualitative binary follow-up question about self-stated preference certainty, and that the hypothetical subjects did not know about the follow-up question when the hypothetical VOT choice was made. Hence, this study adds more support to the existing literature of certainty calibration through a qualitative binary follow-up question as a good method to elicit hypothetical values that corresponds to real values for private goods.

The hypothetical bias found for the non-certain subjects is positive which, in other words, implies that VOT based on these subjects would be higher than VOT based on subjects of the real treatment. Hence, the bias is in the opposite direction compared to the result of Brownstone and Small (2005) and Isacsson (2007). The plausible explanation is that subjects did not experience a scheduling constraint in this experiment which follows since the subjects, when the offer was given, already had devoted this time for the experiment. In this case, of the non-binding constraints there is a tendency that the effect between hypothetical treatment and real treatment is eliminated, or at least small, for the time constraint. Then, the effect of the budget constraint leads to a positive hypothetical bias caused by the similar mechanism as found in experiments of hypothetical bias for other types of goods.

An important similarity between this study and the WTA experiment of Isacsson (2007), and to some extent also Brownstone and Small (2005), is the fact that the time the subjects are offered to buy/sell is time immediate to the

choice occasion. The planning horizon for time may be important and there may be more difficult to use the released time in this experiment because the subjects have planned their activities with the completed experiment hour in their mind. If this issue is not fully comprehended for hypothetical subjects, the consequence will be a positive hypothetical bias. The basis for this alternative interpretation may be viewed as the opposite of scheduling constraints.

Another possible explanation to the result that only few subjects of the real treatment did accept the offer, despite the low offer price, may be related to sunk costs. The subjects have actually devoted time for transportation to participate in the experiments and may respond to the offer like "when I already have made an effort to participate in this experiment, I am not willing to pay any money at all for leaving earlier". In economic terms, this type of behavior is not rational but may, of course, still influence actual behavior.

How can then the policy implications of this study be concretized? When VOT is used in cost benefit analysis, a general VOT may be more usable since road-users have a longer time horizon to make the trade-off between travel time and travel cost. However, this long time horizon is, if not impossible, at least very problematic to analyze in an experiment. One possible approach to shed some light on this issue is an experiment that releases time further away in the future but such an approach would strongly raise the requirements for the experimental design. The bus-experiment of Isacsson (2007) partly tests this issue and find a negative hypothetical bias. Smith and Mansfield (1998), moreover, might have been able to test this approach but since no binding

agreement existed in their experiment, their "real" treatment should not be considered as real. Possibly, the answer is that the two constraints of VOT that works in different direction when affecting hypothetical bias tend to cancel out and that the mean hypothetical VOT, based on both WTP and WTA choices and where some subjects experience scheduling constraints whereas others do not, is fairly close to the real mean VOT. More research on this topic is required, however.

To finalize the paper, some other suggestions for future research are given. First of all, it would be interesting to test the method of certainty calibration in a willingness to accept (WTA) for time context where there are scheduling constraints, which is an issue that has not been studied before. Furthermore, no formal theory of certainty calibration exists and the method can be criticized to be an ad-hoc method without a connection to theories of behavioral economics. If not formulating a theory of certainty calibration, another interesting topic would be to analyze empirically whether individuals really base their certainty on the given hypothetical context or whether some individuals always are certain regardless of the context.

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Appendix

Here below are the formulations of the offer questions for the real and hypothetical treatment given. Both examples correspond to the offer price of 10 SEK and are freely translated from Swedish. Finally, also the certainty follow-up question is presented.

Real treatment:

You are now going to choose if you want to leave this study 45 minutes in advance on a payment of 10 SEK which will be deducted from the cash compensation you are promised for participating in the study. During the remaining 45 minutes you are going to answer more questionnaires like questionnaire 2.

What do you choose? Circle your answer!

Leave 45 minutes in advance and pay 10 SEK *Finish the study*

Hypothetical treatment:

Suppose that you now would be going to choose if you want to leave this study 45 minutes in advance on a payment of 10 SEK which would have been deducted from the cash compensation you are promised for participating in the study. During the remaining 45 minutes you are going to answer more questionnaires like questionnaire 2.

What would you choose? Circle your answer!

Leave 45 minutes in advance and pay 10 SEK *Finish the study*

Follow-up question:

Are you completely certain that you would choose like you did in the last question if the choice would have been real and not hypothetical? Circle your answer!

Yes, completely certain *No, not completely certain*

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Table 1
Descriptive statistics for variables of individual characteristics at different offer prices divided into real and hypothetical treatment

	Real		**Hypothetical**		***p*-value**
Variable	**Mean**	**Std. Error**	**Mean**	**Std. Error**	
			Offer = 10 SEK		
Age	21.4	0.39	22.0	0.57	0.42
Female	0.45	0.11	0.39	0.09	0.67
Cohabitant	0.23	0.09	0.21	0.08	0.91
Income (SEK/month)	6599	816	6009	540	0.53
Univ1sem	0.86	0.07	0.86	0.07	0.95
No. of observations	22		28		
			Offer = 30 SEK		
Age	22.6	1.03	21.8	0.55	0.45
Female	0.46	0.10	0.53	0.10	0.60
Cohabitant	0.29	0.09	0.11	0.06	0.10
Income (SEK/month)	4954	484	6032	543	0.14
Univ1sem	0.86	0.07	0.82	0.07	0.72
No. of observations	28		28		
			Offer = 50 SEK		
Age	23.3	1.18	21.0	0.35	0.05
Female	0.44	0.10	0.34	0.09	0.48
Cohabitant	0.12	0.07	0.14	0.07	0.85
Income (SEK/month)	7596	1850	7172	844	0.83
Univ1sem	0.80	0.08	0.79	0.08	0.95
No. of observations	25		29		
			All offer prices pooled		
Age	22.5	0.56	21.6	0.29	0.13
Female	0.45	0.06	0.42	0.05	0.71
Cohabitant	0.21	0.05	0.15	0.04	0.33
Income (SEK/month)	6317	689	6413	383	0.90
Univ1sem	0.84	0.04	0.82	0.04	0.78
No. of observations	75		85		

Note: The p-values correspond to two-tailed t-tests of the hypothesis of equal means across the real and hypothetical treatment. The offers correspond to the price of 45 minutes meaning that the hourly price of the offers are 13.33, 40, and 66.67 SEK respectively.

Table 2
Number of accepted offers at different offer levels divided into real and hypothetical treatment

	Real		**Hypothetical**		***p*-value**
Variable	**Number**	**Mean**	**Number**	**Mean**	
Offer = 10 SEK	3/22	0.14	6/28	0.21	0.71
Offer = 30 SEK	1/28	0.04	4/28	0.14	0.35
Offer = 50 SEK	1/25	0.04	1/29	0.03	1.00
All offer prices pooled	5/75	0.07	11/85	0.13	0.29

Note: The p-values correspond to two-tailed Fisher's exact tests of the hypothesis of equal means across the real and hypothetical treatment. The offers correspond to the price of 45 minutes meaning that the hourly price of the offers are 13.33, 40, and 66.67 SEK respectively.

Table 3
Complementary log-log estimation of the probability to accept the offer to leave the experiment

Variable	**Coefficient**	**Std. Error**
Offer price	-0.042*	0.019
Hypothetical	0.670	0.537
Age	-0.033	0.066
Female	0.026	0.517
Cohabitant	-0.174	0.834
Income (given in 1000 SEK/month)	0.034	0.050
Univ1sem	-0.243	0.785
Intercept	-0.849	1.610
No. of observations	160	
Pseudo-R^2	0.079	

Note: * denotes significance at the five percent level. Standard errors are robust.

Table 4
Number of accepted and rejected offers where real subjects are compared to non-certain hypothetical subjects and certain hypothetical subjects respectively

Treatment	**Accept offer**	**Reject offer**
Real subjects	5	70
Non-certain hypothetical subjects	5	20
p-value	0.11	
Real subjects	5	70
Certain hypothetical subjects	6	54
p-value	0.54	

Note: The p-values correspond to two-tailed Fisher's exact tests of the hypothesis of equal proportions accepting the offer across the real subjects and non-certain hypothetical subjects and certain hypothetical subjects respectively.

Table 5
Complementary log-log estimation of the probability to accept the offer to leave the experiment where the hypothetical effect is allowed to be different for certain subjects and non-certain subjects

Variable	**Coefficient**	**Std. Error**
Offer price	-0.046*	0.019
Hypothetical	1.409*	0.700
Certain	-1.101†	0.581
Age	-0.035	0.074
Female	0.151	0.518
Cohabitant	-0.408	0.882
Income (given in 1000 SEK/month)	0.025	0.586
Univ1sem	0.039	0.678
Intercept	-0.915	1.753
Hypothetical effect of non-certain subjects	1.409*	0.700
Hypothetical effect of certain subjects	0.308	0.583
No. of observations	160	
Pseudo-R^2	0.104	

Note: * and † denote significance at the five and ten percent level respectively. Standard errors are robust. The hypothetical effect of certain subjects are calculated as the sum of the coefficients of *Hypothetical* and *Certain*.