

Student Sample of DOSE

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I Useful Global Definitions

This is basically a reduced version of the First and Second Wave of the World Econographics Project. Module numbering is kept consistent for ease of programming, the major difference is a large number of removed modules, changes in some of the structural elements discussed in Section IV.

Sections that have some changes are:

- Section II.A
- Section II.B
- Section III.A.3 (minor changes to question wording)
- Section III.D (changed to the Robust Econographics implementation)
- Section III.E (changed to the Robust Econographics implementation)
- Section IV

All other sections are either the same as in prior versions, or have been deleted.

New questions, implemented as in the Robust Econographics Survey, are found in Section III.X and III.Y.

New demographic questions are found in Section III.Z.

I.A Payments

Payments to respondents will be in points. The exchange rate is roughly 1 point = \$0.001. For more on payment information, see IV.A.

I.B Adaptive Procedure

An adaptive procedure determines a list of binary choice questions where each choice leads to a different further choice. These question trees will be generated beforehand by us. The

adaptive procedure we will use is called DOSE. DOSE will only be used as an elicitation procedure in III.A.1 and III.A.3.

I.C Design Principles

Once we identified a number of traits that we wanted to elicit, we used four design principals to decide how to elicit them. In particular, we looked for ways that would:

1. Be implementable on a survey,
2. Be implementable cross-culturally,
3. Avoid correlated measurement error across traits, and
4. Take steps to minimize measurement error within a trait.

These were listed in order of importance. So, for example, if a way of measuring a trait was proposed that would reduce correlated measurement error between that trait and another, but it was not implementable cross-culturally, then this proposed way would not be used.

Some examples of how this was used follow.

1. When deciding on measures of time discount (or time inconsistency) we rejected those that would require the survey taker to log in again at some point in the future (principle 1).
2. When looking for intelligence measures, we focused on those that could be measured using questions that relied on graphical representations (principle 2).
3. When deciding between different ambiguity aversion measures, we chose one that would not require us to first estimate risk-aversion, as errors in our elicitation of risk-aversion would then be correlated with errors in our elicitation of ambiguity aversion (principle 3).
4. When eliciting the WTP–WTA gap, we separated the questions for WTP and WTA so as not to introduce measurement error caused by a consistency bias (principle 4).
5. When eliciting a trait we did so twice, as this would reduce measurement error within a trait by instrumenting (principle 4).

I.D Multiple Price List

Many of the modules will use a **Multiple Price List** (MPL) to determine the certainty equivalent of a lottery. This is a series of questions presented simultaneously with the choices

in two columns. Each question asks the respondent if they would like one item or the other. One column of these questions always contains the same answer (say, a monetary amount), while the other varies (for example, lotteries with different probabilities of payoff). These require some training on the part of respondents, and may also require some additional work to code up properly.

Figure 1: An Example of Using MPL to elicit a certainty equivalent

**Now consider a lottery that has a 50% chance of paying \$5,
and a 50% chance of paying \$0. Would you rather have?**

<input checked="" type="checkbox"/> Lottery	or	<input type="checkbox"/> \$0 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$1.50 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$2.00 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$2.50 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$2.65 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$2.80 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$2.95 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$3.10 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$3.35 dollars?
<input type="checkbox"/> Lottery	or	<input type="checkbox"/> \$3.50 dollars?
<input type="checkbox"/> Lottery	or	<input checked="" type="checkbox"/> \$5.00 dollars?

For an example of an MPL, see Figure 1. This example is constructed to elicit the certainty equivalent for a 50/50 lottery over \$5 and \$0. For this to be incentive compatible, the respondent will be told that should question be (randomly) selected to be paid, then one of the lines will be chosen (randomly), and they will get the choice from that line. For more on incentives, see IV.A.

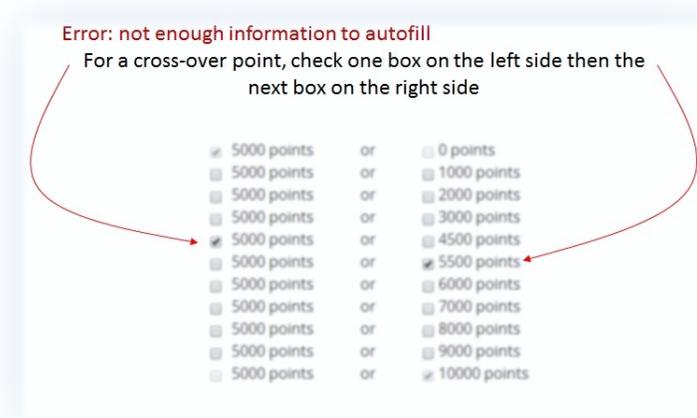
Other things of note are that the top right and bottom left boxes are already filled in. This is because no one should want to buy the lottery for more than \$5, or less than \$0, and also because filling in these top and bottom boxes has been shown to prevent multiple cross-overs. That is, if this is used correctly by a respondent, the responses on the right will be filled in up to some point, above which only boxes to the left will be filled in. For example, if someone had a certainty equivalent of \$2.10, then the bottom 6 boxes on the left should be filled in, and the top 5 boxes on the right should be filled in.

If there is some other pattern than the one described above, then this would have multiple cross-overs, and we wouldn't be able to determine the respondent's certainty equivalent. To prevent this, we suggest a couple things. First, there should be some sort of brief training

before the first MPL. Second, there should be an auto-complete feature, such that once a cross over has been made (say by ticking the bottom 4 right boxes, and then the left box for the 5th from the bottom), then a button could be pushed to fill in the rest of the boxes. Third, if a respondent tries to move forward with anything other than a single cross-over pattern (or all boxes on one side or the other ticked), then they should be given an error message and be asked to try again.

The error messages that will be given will be graphical and demonstrate the “correct” pattern that we are looking for. There will be two error messages. The first, in Figure 2, should be displayed if the respondent tries to autofill or advance without specifying a single-crossover. This will usually occur because they have left a “gap” somewhere by not filling in a box in one of the rows between the last time they checked a box on the left side and the first time they checked a box on the right side. (It can also occur if they don’t check any boxes on one of those sides.)

Figure 2: Error message if there is not enough information

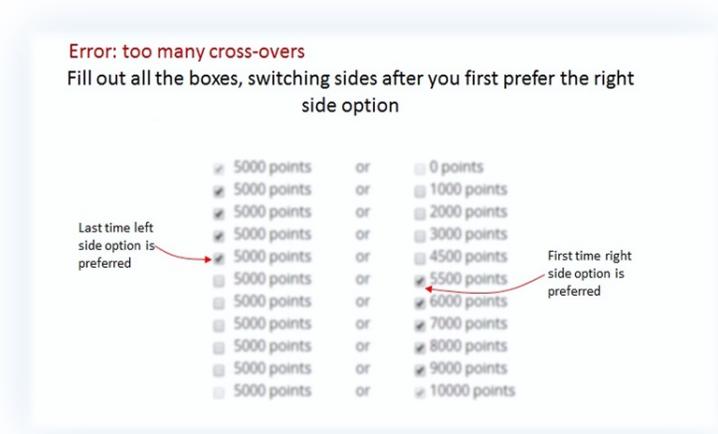


The second error message is displayed in Figure 3. This one should be used when there are multiple crossovers, that is, when the respondent picks a box on the left-hand-side below checking one on the right-hand-side. (Note that the “sides” may be reversed in some places when the options are ascending. This can happen in Section III.E and Section ??, and is noted there.) Once again, this error can be given if they try to advance or autofill without the proper configuration.

Note further that the spacing between options on the right are irregular. This is done to make sure that we are 1) covering the full range of values, while 2) emphasizing discrimination in the range where respondent’s values are likely to lie, and 3) being as parsimonious as possible. In the example above we would be able to tell that the respondent’s certainty equivalent lay somewhere between \$2.05 and \$2.20, while if we used regular intervals we would either have a wider range of possible values, more questions, or both.

Finally, there should be a “hover” link at the bottom of the page (above the forward arrow button) that gives shortened instructions in case the respondent becomes confused.

Figure 3: Error message for multiple cross-overs



The exact text of those instructions is the same as some of the training, described in Section II.D.

I.E Payment

Payment for an MPL is straightforward: if a question containing an MPL is selected for payment, then a row is selected at random from amongst the rows in the MPL, and the respondent is paid according to their choices.

Using Figure 1 as an example, suppose that Row 3 has been randomly selected for payment, and the respondent chose “Lottery” in that row. Then the lottery would be run, and the respondent would be paid according to the outcome (which would be a 50% chance of 0, or a 50% chance of \$5). As another example, suppose instead that Row 7 was chosen for payment, and in that row the respondent had selected “\$2.95 dollars”. Then the respondent would be paid \$2.95.

II Prelude to the Survey

II.A Recruitment and Consent Form

Participants will be recruited by the authors from participant pools of university economics labs. We will send a recruiting email asking interested parties to express their interest, tell us their name, school, etc. Qualified participants will be sent a unique link, which the authors will distribute. YouGov will pay participants through a Visa gift card

When a participant clicks on the link they should be taken to a consent form, with text as follows:

We invite you to participate in a research study. You will be asked to answer a series of questions, and make choices between sure payments and lotteries.

You will be paid \$3 for completing the survey. In addition, you may earn up to \$32.50 depending on your answers in the study, and luck.

If you have read this form and have decided to participate in this experiment, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. You have the right to refuse to do particular tasks. Your individual privacy will be maintained in all published and written data resulting from the study. You may print this form for your records.

CONTACT INFORMATION: If you have any questions, concerns or complaints about this research study, its procedures, risks and benefits, you should contact Stephanie Wang at 408-888-0397 or at swwang@pitt.edu.

You may contact the Human Subjects Protection Advocate at the University of Pittsburgh Institutional Review Board at 1-866-212-2668 if you have questions about your rights as a research subject. If you agree to participate, please proceed to the study tasks.

1. Please confirm that you are between 18 and 65 years of age, and agree to participate in this study:
 - a. Yes, I am between 18 and 65 years of age, and agree to participate [→ proceed to survey]
 - b. No, I am not eligible, or do not wish, to participate [→ bring them to a “Thank you for your help with our research” page and disable link]

II.B Instructions

Instructions should reflect standard experimental instructions. This has been updated to reflect the fact that participants will need to know what points are. Also, quantities need to be correct in both the instructions and in the attention quiz.

This study is paid in points, with **1,000 points** equalling **\$1**. At the end of the survey you will be told how many points you earned, and these will be converted into a Visa giftcard, redeemable at thousands of internet shopping sites. Please allow up to two weeks for processing of your Visa giftcard.

[add text below, up to next square bracket, when the respondent clicks forward]

If you read these instructions carefully and make good decisions **you may earn up to 32,500 points** by the end of the survey. **Please pay close attention**, as you will need to correctly answer a few questions about these instructions.

[add text below, up to next square bracket, when the respondent clicks forward]

During the survey, you will be asked a number of questions that ask you to **choose between different types of lotteries and payments**. At the end of the survey, **two** of these questions will be selected randomly, and answers to those questions will determine how many points you earn.

[add text below, up to next square bracket, when the respondent clicks forward]

For example, suppose your earnings were determined, in part, by a question that asked you to decide between

- a lottery that gave a 50% chance of 10,000 points and a 50% chance of 0 points, and
- a fixed amount of 1,000 points.

If you chose the lottery, then it would be run, and you would get **either** 0 or 10,000 points, each with 50% probability. **If you chose 1,000 points**, then 1,000 points would be directly credited to your account.

Thus, the points you earn will depend on **both** your choices and luck.

[add text below, up to next square bracket, when the respondent clicks forward]

In addition to the points earned for your choices, you will earn 3,000 points for completing the survey. Thus, the minimum number of points you will earn for taking this survey is 3,000. The maximum is 32,500. The average is 10,000. You will not earn points unless you complete the survey.

The study will take you between 10 and 15 minutes. The study pays a lot more than normal online tasks because we want you to pay close attention the entire time.

II.C Attention Quiz

After reading the instructions respondents should be asked a series of questions. Failure to get all of them correct should send them back to the instruction screen with a note at the top stating: “You did not correctly answer all questions about the instructions. Please read them closely again.” This should repeat until the respondent gets all questions correct. The questions are:

1. At the end of the survey, how many questions will be randomly selected so that points will be allocated according to your answers? [multiple choice, 1–5, correct answer is 2]
2. Your payment for this survey will depend on i. luck, ii. your choices, iii. your choices and luck, iv. none of the above? [correct answer is iii.]
3. How long will the survey take? i) Between 10 and 15 minutes, ii) between 10 and 20 minutes, iii) between 30 and 45 minutes, iv) one hour [correct answer is i.]

4. What is the maximum number of points you can earn for taking this survey?
i. 3,000, ii. 12,500, iii. 22,500, iv. 32,500, v. 42,500? [correct answer is iv.]

II.D MPL Training

This describes a training that we would like all respondents to go through before beginning the survey. In addition, the text from below “[next page]” to the beginning of the “Example Question” should be available as a “Help” link at the bottom of the page, as described in Section I.D.

This survey often uses a special type of question. We want to help you answer these questions **quickly** and **accurately**.

This special type of question has many similar choices, as in the example below. The options on the left are always the same, while those on the right change—getting better and better.

If a question like this is picked for payment, **one row** will be selected, and you will be paid according to the choice **you made in that row**. It is important that your answers in each row **are accurate** so you will get the payment **you want**.

You will see a screen that looks like this.

[example figure here—should just be a miniaturized screen shot of the MPL on the next screen]

[next page]

To answer these types of questions **quickly** and **accurately** we suggest you:

1. Start by looking at the **top row**, and think carefully about each row in turn.
2. For each row where you **prefer the option on the left** over the option on the right, check the box on the left hand side.
3. When you find the **first question where you prefer the option on the right** over the option on the left, check the box on the right.
4. Notice that the option on the right is always better as you go down the list. This means that after you choose one option on the right, you should choose the option on the right for all rows below. Your answers should therefore “cross over” from left to right **only once**.
5. Once you have filled in the “cross over” point you may hit the Autofill button to fill in the rest of the chart faster. Alternatively, you may check every box manually.

All rows must have a box checked for you to continue to the next page.

If you need to start over at any point, hit the **Reset** button to clear out all of the checkmarks.

1. Example Question: For each row in the table below, which option would you prefer? [MPL here]
 - a. 5,000 points OR
 - b. x points

[For values of

$$x \in \{0, 1000, 2000, 3000, 4500, 5500, 6000, 7000, 8000, 9000, 10000\}.$$

[Error checking here should not only consider the format, but in addition, it should ensure that the crossover is between 4500 and 5500. As in any other MPL, any errors in filling it out should return them to the MPL with the same boxes filled out, and a detailed error message.]

Note that if the respondent does not properly answer (that is, provide an answer with the crossover between 4500 and 5500), then the following error message should appear:

You have indicated in row *YYY* that you prefer *ZZZ* points to 5000 points. But *ZZZ* points is less than 5,000 points, which means you would get more by selecting 5000 points. Please correct this.

In all the other questions on this survey, there is no right or wrong answer. However, you should make sure that you select the option that you prefer on **each line**.

The error should fill in the *YYY* and *ZZZ* above with a line that they answered incorrectly.

III What we Would Like to Measure and How

III.A Risk- and Loss-Aversion, and Time Preferences

These are the only questions that use the DOSE procedure, listed above. Since time preferences also involve estimating risk preferences, we will first go through the risk and loss-elicitation, then through a bridge process (which will be invisible to respondents), and then on to the time-preferences.

III.A.1 Risk- and Loss- Aversion

These parameters will be jointly estimated by asking subjects to choose between lotteries over gains and losses and a certain outcome. The lotteries will be determined using an adaptive

procedure (DOSE) to optimally fit the functional forms of $x^{1-\rho}$ for gains and $-\lambda x^{1-\rho}$ for losses. The number of lotteries will be chosen to result in a certain standard error for the parameters ρ and λ . No lottery will contain a payout or loss greater than 10,000 points. For more on the level of incentives, see II.B and IV.A.

Before starting these questions, respondents will be given an introductory blurb

In the next few questions, you will be asked to choose between two lotteries.

You will start this section with 10,000 points, which you may lose based on the lotteries you choose in this section. That is, some of the lotteries in this section may both **add** to or **subtract** from this initial 10,000 points.

For example, suppose you chose a lottery that had a 50% chance of adding 5,000 points, and a 50% chance of subtracting 5,000 points. In the case of winning, the 5,000 will be added to your additional 10,000. In the case of a loss, the 5,000 will be subtracted from your initial 10,000. Note that you will never have the possibility of losing more than 10,000, so at worst you will end this section with 0 points.

After hitting the forward button, they will be moved to the questions. Some example questions are:

1. Which of the following options do you prefer?
 - a. A lottery where you may receive 7,000 points, or lose 5,000 points, each with 50% probability,
 - OR
 - b. Receiving 0 points for certain.

2. Which of the following options do you prefer?
 - a. A lottery where you may receive 7,000 points, or receive 0 points, each with 50% probability,
 - OR
 - b. Receiving 3,000 points for certain.

Note above that if the amount in a lottery, or certain payoff, is 0 points this should be presented as “receive 0 points”.

As a matter of implementation, these lotteries will be given to YouGov as a complete tree. This will come in the form of a spreadsheet where each row contains the question number, the size of the gain, the size of the loss, the size of the sure thing, the question the respondent should be directed to if they answer A, and the question the respondent should be directed to if they answer B. So, for the example above, this would be specified as a row containing something like 1, 7000, 5000, 1000, 2, 3. Note that if question n is answered, then the question the respondent should be directed to if they answer A is $2n$, and if they answer B the question the respondent should be directed to is $2n + 1$.

When the respondent reaches a question at the end of the tree, this will be in the file as a row with a question number, NA for all fields except subsequent questions, and 0 in each subsequent section column.

Note that as different “branches” will have different lengths, the data should be passed back to us in a format that has something like:

riskQuestion1, riskQuestion1choice, riskQuestion2, riskQuestion2choice, . . . , riskQuestionMAX, riskQuestionMAXchoice, finalRiskQuestion

where MAX is the maximum length of a branch in the tree, and if a respondent goes down a branch that has less than MAX choices, then the question numbers they never answer should contain missing data indicators. Note that the last question number that the respondent is confronted with will not have a choice associated (it will be a terminal, or “leaf”, node). The number of this “question” should go in the field finalQuestion.

We will supplement this with an additional (incentivized) risk question, drawn from Charness and Gneezy, and an additional (non-incentivized) risk question, drawn from Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2011) “Individual risk attitudes: Measurement, determinants, and behavioral consequences”.

If one of the above questions is selected for payment, 10,000 points should be added to the payoff of the lottery (or sure amount) chosen by the respondent.

III.A.2 The Bridge

To get from risk to time elicitation, we will provide a .csv file that maps between terminal nodes in Section III.A.1 to starting nodes in Section III.A.3. This .csv file will have a simple structure, two columns, the first with the terminal node from Section III.A.1, and the second with the starting node for the tree in Section III.A.3.

III.A.3 Time Preferences

The question wording here has been updated to reflect the fact that the respondents will not have a YouGov account.

We will use the standard approach using choices between payments that will be given at different times (current, and in the future) to estimate a discount function. We will use the DOSE procedure to maximize the informational value to estimate a model with discounted utility function $\beta\delta^t x^{1-\rho}$ (where $\beta = 1$ for immediate payment). That is, we will estimate a quasi-hyperbolic discounting model.

Before answering these questions, the respondents will be given a brief set of instructions:

The next few questions ask you to choose between amounts of points at different times, many of which are **in the future**. If one of these questions is selected for payment, the number of points displayed will be credited to your account on the day shown.

For your reference, today is (November 12). [fill in date at the time of survey]

Here are two examples of the questions that will be asked:

1. Which of the following options do you prefer?

a. 7,000 paid today (November 12)

OR

b. 8,000 paid 7 days from now (November 19)

2. Which of the following options do you prefer?

a. 3,000 paid 1 day from now (November 13)

OR

b. 10,000 points paid 90 days from now (February 10)

The spreadsheet here will follow a similar layout to that in III.A.1 and will have the question number, the number of points in option A, the number of days from today that that option A will be paid (with 0 indicating today), the number of points for option B, the number of days from today that option B will be paid, which question the respondent should be directed to if they choose A, and which question the respondent should be directed to if they choose B. The spreadsheet entry for this question (assuming it is question 1) would be something like: 1, 7000, 0, 8000, 7, 2, 3. The major difference is that different respondents will start at different nodes (as opposed to the risk- and loss-elicitation, where everyone started at node 1), according to the process described in III.A.2 above.

Note three things about this entry: first, the “0” days for the first date of payment needs to be translated into “today” in the question wording. Second, when a date is given in the future, the actual date should be shown in addition to how far away it is (I am writing this on June 9th, so June 16th is 7 days away). This will need to be calculated on the fly as each respondent takes the survey. Third, if question n is answered, then the question the respondent should be directed to if they answer A is $2n$, and if they answer B the question the respondent should be directed to is $2n + 1$.

The second example question would have an entry of (assuming it is question 2): 2, 7000, 30, 8000, 37, 4, 5. The output data should be in a similar format to that in III.A.1, however, rather than “riskQuestion1” (for example), the field should be called “timeQuestion1”.

If a question from this module is selected for payment, the payment may need to occur in the future, see Section IV.C.

III.D CHANGED: Endowment Effect: WTA

All that has been changed here are the amounts in the questions, and the MPLs, to add dominated amounts. Error messages were added that are triggered when a dominated amount is chosen.

This section and the next will be used to compute the endowment effect. They are separated into two modules because they use the same lottery, and so need to be separated to avoid respondents worrying (or, at least, worrying too much) about the appearance of consistency. See IV.D.

In the willingness to accept (WTA) portion, a respondent will be given a lottery, and, using an MPL, have the opportunity to sell it. In the willingness to pay (WTP) portion (III.E) they will be given a fixed amount of points and have the option, through an MPL, to buy the same two lotteries they were given in the WTA section.

Subjects will be given a lottery, and we will then determine how much we would need to pay them to give it up. Certainty equivalents will then be elicited using an MPL.

This section asks you two questions where you will be given a lottery and have the opportunity to sell it.

[next page]

1. For this question, you are given a lottery ticket that has a **50% chance** of paying you **9,000 points**, and a **50% chance** of paying you **1,000 points**.

You have two options for this lottery ticket:

1. Keep it or
2. Sell it for a certain amount of points (for example, 3,000 points)

[Present respondents with an MPL.]

For each row in the table below, which option would you prefer?

- a. The lottery ticket OR
- b. Sell it for x points

[where x will take the values of

$$x \in \{0, 1000, 2000, 2500, 3000, 3250, 3500, 3750, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 6000, 7000, 8000, 9000, 10000\}.$$

2. For this question, you are given a lottery ticket that has a **50% chance** of paying you **8,000 points**, and a **50% chance** of paying you **2,000 points**.

You have two options for this lottery ticket:

1. Keep it or
2. Sell it for a certain amount of points (for example, 3,000 points)

[Present respondents with an MPL.]

For each row in the table below, which option would you prefer?

- a. The lottery ticket OR
- b. Sell it for x points

[where x will take the values of

$$x \in \{1500, 2000, 2500, 3000, 3250, 3500, 3750, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 6000, 7000, 8000, 9000\}.$$

For Question 1 if the respondent preferred to sell the lottery for 1,000 points in the second row, the following error message should be displayed:

You indicated in the second row that you would sell the lottery ticket, which is guaranteed to pay at least 1,000 points, but possibly more, for 1,000 points. Are you sure this is what you want?

In the same question if the respondent preferred not to sell the lottery for 9,000 points (in the second to last row) the following error message should be displayed:

You indicated in the second-to-last row that you would prefer not to sell the lottery ticket, which pays at most 9,000 points, but possibly less, for 9,000 points. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 2 if the respondent preferred to sell the lottery for 2,000 points in the second row, the following error message should be displayed:

You indicated in the second row that you would sell the lottery ticket, which is guaranteed to pay at least 2,000 points, but possibly more, for 2,000 points. Are you sure this is what you want?

In the same question if the respondent preferred not to sell the lottery for 8,000 points (in the second to last row) the following error message should be displayed:

You indicated in the second-to-last row that you would prefer not to sell the lottery ticket, which pays at most 8,000 points, but possibly less, for 8,000 points. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

III.E CHANGED: Endowment Effect: WTP

Changes here are to the value of the lotteries and the MPLs. We have also added dominated-option warning messages.

This is the opposite of WTA: respondents will be given a fixed amount (say 10,000 points), and then we will determine the certainty equivalent for the lotteries in WTA, above. Note that in order to be as consistent as possible, the MPL options on the right-hand-column (the purchase price of the lottery) should be descending, rather than ascending.

This section asks you two questions where you will be given a stock of points that you can use to purchase a lottery ticket.

[next page]

1. For this question, you **have been given 10,000 points**. You will be offered the opportunity to exchange some of these points for a lottery ticket. This lottery ticket has a **50% chance** of paying you **9,000 points**, and a **50% chance** of paying **1,000 points**.

For example, if you choose to pay 2,000 points for a lottery ticket, and this question is chosen for payment, you will:

- Pay 2,000 points for the lottery ticket
- Keep 8,000 points for yourself
- Earn whatever proceeds you get from the lottery ticket (if any)

[Present respondents with an MPL.]

For each row in the table below, which option would you prefer?

- a. Keep 10,000 points OR
- b. Buy the lottery ticket for $10,000 - x$ points and keep the remaining x

[where x will take the values of

$$x \in \{0, 1000, 2000, 3000, 4000, 4500, 4750, 5000, 5250, 5500, 5750, 6000, 6250, 6500, 6750, 7000, 7500, 8000, 9000, 10000\}.$$

Note that the options for the purchase price should be descending (and the remainder ascending).]

2. For this question, you **have been given 9,000 points**. You will be offered the opportunity to exchange some of these points for a lottery ticket. This lottery ticket has a **50% chance** of paying you **8,000 points**, and a 50% chance of paying **2,000 points**.

For example, if you choose to pay 3,000 points for a lottery ticket, and this question is chosen for payment, you will:

- Pay 3,000 points for the lottery ticket
- Keep 6,000 points for yourself
- Earn whatever proceeds you get from the lottery ticket (if any)

[Present respondents with an MPL.]

For each row in the table below, which option would you prefer?

a. Keep 9,000 points OR

b. Buy the lottery ticket for $9,000 - x$ points and keep the remaining x

[where x will take the values of

$$x \in \{0, 1000, 2000, 3000, 3500, 3750, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 5750, 6000, 6500, 7000, 7500\}.$$

Note that the options for the purchase price should be descending (and the remainder ascending).]

For Question 1 if the respondent indicated he wanted to buy the lottery for 9,000 points in the second row, the following error message should be displayed:

You indicated in the second row that you would buy the lottery ticket, which pays at most 9,000 points, but possibly less, for 9,000 points. Are you sure this is what you want?

In the same question if the respondent prefers to keep the points rather than buy the lottery for 1,000 points (in the second to last row) the following error message should be displayed:

You indicated in the second-to-last row that you would prefer to keep all your points rather than pay 1,000 points for the lottery ticket, which is guaranteed to pay at least 1,000 points, but possibly more. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 2 if the respondent indicated he wanted to buy the lottery for 8,000 points in the second row, the following error message should be displayed:

You indicated in the second row that you would buy the lottery ticket, which pays at most 8,000 points, but possibly less, for ,000 points. Are you sure this is what you want?8

In the same question if the respondent prefers to keep the points rather than buy the lottery for 2,000 points (in the second to last row) the following error message should be displayed:

You indicated in the second-to-last row that you would prefer to keep all your points rather than pay 2,000 points for the lottery ticket, which is guaranteed to pay at least 2,000 points, but possibly more. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

III.L IQ

Our IQ items come from The International Cognitive Ability Resource (ICAR—Condon and Revelle). The ICAR terms of use do not allow us to post screenshots or the actual items used. However, they allow fairly easy access once they verify academic credentials, so you may sign up with them and examine the items. We used six puzzles in total, three of the “matrix rotation” (MR) type and three of the “3-D rotation” (3DR) type. The six puzzles we used were MR.43, MR.45, MR.44, R3D.20, R3D.16, R3D.22. After completing each set of three puzzles respondents were asked the following questions:

How many of the three previous puzzles do you think you correctly answered? [a text box that only allows numbers between 0 and 3]

Now, think about 100 typical people in the United States.

Where do you think you rank in terms of how many correct answers you got? For example,

- if you think you got the **most correct**, you should answer **1**.
- If you think you got the **least correct**, you should answer **100**.

[Text box where any number between 1 and 100 can be entered.]

III.M Cognitive Reflection Test

Questions in this section come from Fredrick, “Cognitive Reflection and Decision Making”.

In this section we ask you three simple arithmetic questions.

[next page]

1. A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?

----- cents [allow only numbers between 0 and 100]

[next page]

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

----- minutes [allow only numbers between 0 and 1000]

[next page]

3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

----- days [allow only numbers between 0 and 48]

III.X NEW: Risk Aversion 2

In the next two questions, you will be asked to choose between a lottery and fixed amounts of points.

1. For each row in the table below, which option would you prefer?

a. A 50% chance of 5,000 points, and a 50% chance of 0 points OR

b. x points

[for values of

$x \in \{-500, 0, 500, 1000, 1250, 1500, 1750, 2000, 2250, 2500, 2750, 3000, 3250, 3500, 3750, 4000, 4500, 5000, 5500\}.$]

[next page]

2. For each row in the table below, which option would you prefer?

a. A 50% chance of 4,000 points, and a 50% chance of 1,000 points OR

b. x points

[for values of

$x \in \{600, 1000, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 4000, 4600\}.$]

For Question 1 if the respondent chooses 0 points in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer 0 points over the lottery, which is guaranteed to pay at least 0 points, but possibly more. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over 5,000 (in the second-to-last row) points the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which pays at most 5,000 points, but possibly less, to 5,000 points for sure. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 2 if the respondent chooses 1,000 points in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer 1,000 points over the lottery, which is guaranteed to pay at least 1,000 points, but possibly more. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over 4,000 (in the second-to-last row) points the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which pays at most 4,000 points, but possibly less, to 4,000 points for sure. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

III.Y NEW: Loss Aversion

For these questions (but not for those in any other section), the negative and positive options in the MPL should be expressed differently. If the point amount given in x is, for example, -3000 points, then this should be shown as “Losing 3,000 points”, whereas if it is 3000, it should be shown as “Gaining 3,000” points. 0 should be expressed as “0 points”.

Before starting these questions, respondents will be given an introductory blurb.

In the next few questions, you will be asked to choose between a lottery and fixed amounts of points.

You will start this section with 10,000 points, which you may lose based on the lotteries you choose in this section. That is, some of the lotteries in this section may both **add** to or **subtract** from this initial 10,000 points.

For example, suppose you chose a lottery that had a 50% chance of adding 5,000 points, and a 50% chance of subtracting 5,000 points. In the case of winning, the 5,000 will be added to your additional 10,000. In the case of a loss, the 5,000 will be subtracted from your initial 10,000. Note that you will never have the possibility of losing more than 10,000, so at worst you will end this section with 0 points.

[next page]

1. For each row in the table below, which option would you prefer?

a. A 50% chance of winning 5,000 points, and a 50% chance of losing 5,000 points OR

b. [Losing / gaining] x points

[for values of

$x \in \{-6000, -5000, -4000, -3000, -2500, -2000, -1750, -1500, -1250, -1000, -750, -500, -250, 0, 250, 500, 1000, 3000, 5000, 7000\}.$]

[next page]

2. For each row in the table below, which option would you prefer?

a. A 50% chance of winning 4,000 points, and a 50% chance of losing 4,000 points OR

b. [Losing / gaining] x points

[for values of

$x \in \{-5000, -4000, -3000, -2500, -2000, -1750, -1500, -1250, -1000, -750, -500, -250, 0, 250, 500, 1000, 2000, 3000, 4000, 5000\}.$]

[next page]

3. For each row in the table below, which option would you prefer?

a. A 50% chance of losing 5,000 points, and a 50% chance of losing 0 points OR

b. [Losing / gaining] x points

[for values of

$x \in \{-5500, -5000, -4500, -4000, -3750, -3500, -3250, -3000, -2750, -2500, -2250, -2000, -1750, -1500, -1000, -500, 0, 500\}.$

[next page]

4. For each row in the table below, which option would you prefer?

a. A 50% chance of losing 4,000 points, and a 50% chance of losing 1,000 points OR

b. Losing x points

[for values of

$$x \in \{4400, 4000, 3600, 3400, 3200, 3000, 2800, 2600, 2400, 2200, 2000, 1800, 1600, 1400, 1000, 600\}.$$

For Question 1 if the respondent chooses $-5,000$ points in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer to lose 5,000 points over the lottery, which induces a loss of at most 5,000 points, but possibly less. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over 5,000 (in the second-to-last row) points the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which pays at most 5,000 points, but possibly less, to a gain of 5,000 points for sure. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 2 if the respondent chooses $-4,000$ points in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer to lose 4,000 points over the lottery, which induces a loss of at most 4,000 points, but possibly less. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over 4,000 (in the second-to-last row) points the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which pays at most 4,000 points, but possibly less, to a gain of 4,000 points for sure. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 3 if the respondent chooses losing 5,000 points over the lottery in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer to lose 5,000 points for sure to taking the lottery, which induces a loss of no more than 5,000 points, and possibly less. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over 0 points (in the second-to-last row) the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which gives at most 0 points, but possibly less, to 0 points. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

For Question 4 if the respondent chooses losing 4,000 points over the lottery in the second row, the following error message should be displayed:

You indicated in the second row that you would prefer to lose 4,000 points for sure to taking the lottery, which induces a loss of no more than 4,000 points, and possibly less. Are you sure this is what you want?

In the same question if the respondent chooses the lottery over losing 1,000 points (in the second-to-last row) points the following error message should be displayed:

You indicated in the second-to-last row that you would prefer the lottery, which induces a loss of at least 1,000 points, but possibly more, to a loss of 1,000 points. Are you sure this is what you want?

Below each error message should be two buttons “Yes. Continue” and “No. Go back and change my answers.” For each respondent a variable should indicate whether EITHER OF these messages were triggered. This variable should take on values of 0 or 1 (or “no” and “yes”).

III.Z NEW: Demographic Questions

We will need some specific demographics for data cleaning and payment. We’ll use YouGov’s standard question wording for the following:

- Name
- email address (for payment)
- Gender
- Age (or year of birth)
- Family Income
- Employment / unemployment

In addition, we will need the following information:

1. Which of the following best describes your current educational situation?

- a. I am enrolled as an undergraduate student in a college or university
- b. I am enrolled as a graduate student in a college or university
- c. I am not currently enrolled as an undergraduate or graduate student in a college or university

[If the participant answers a. or b. above, please follow up with the following two questions]

2. What college or university are you enrolled in? [text box allowing up to 50 characters]
3. What is your field of study?
 - a. Humanities
 - b. Social Sciences
 - c. Science or Mathematics
 - d. Fine Arts
 - e. Professional (Business, Law, Medicine, etc.)
4. How often do you participate in incentivized studies like this one (online or in an economics or psychology lab)?
 - a. This is my first one
 - b. I participate less than once a year
 - c. I participate a few times a year
 - d. I participate at least once a month

IV Implementation Issues

IV.A Incentives

A single YouGov point is worth about \$0.001. The show up fee we pay (which is set to 500 points above), is about 1/2 of the standard YouGov points for a survey of the length we are

giving here, and the minimum allowed by YouGov.

A basic description of how incentives will actually be provided are in II.B, above. In terms of implementation, it is likely easiest if at the end of each module in III.A-?? a question is selected randomly from that module (with one selection made from each of Section III.A.1 and Section III.A.3, so two will be selected from Section III.A), and, if necessary, the in that question is run. Note that in some cases the selection will result in a sure amount, or, in the case of Section III.A.3, a payment at some point in the future. These per-module payments can be stored temporarily, and then at the end of the survey two of these modules can be randomly selected for payment, and the payment from each can be summed.

The respondent should be shown a summary of their proceeds on the last screen: which question was chosen to be executed, and what the outcome was. Note that for III.A.3 this may include a payment that will take place in the future, and that for ?? this may include a payment from another respondent.

Note that the modules from III.L on are not incentivized, and so should not be included in the set of questions that may be randomly selected for payment.

The incentives here will be higher than normal Yougov surveys, and likely higher than we want to use on future surveys. On the second (pure econographics) pilot, we should consider lowering the incentives for a subset (1/2?) of the population and see if it matters.

IV.A.1 Payment

In order to calibrate payment properly, all questions should pay with equal probability, except for Section III.A.3, which should pay with probability 1/1000.

Note that as 2 questions are paid, two draws should be made each with the above probabilities.

On the final screen, the participants will see the following informaiton:

Thank you for participating in this study! Because of your answers and luck, you have earned [\$reward_now_actual] points, or \$[\$reward_now_actual.dollars], which will be delivered to you by a Visa e-card that will be delivered to your email address (\$email). Please be sure to check your email account for an email from Prepaid Digital Solutions, which will contain information on how to collect your incentive.

[for people who received a later incentive]

text if \$reward_later1 > 0 You will also receive an additional Visa e-card on \$reward_now_date1.

in which there is some pseudo-code in the text for various variables to fill in.

IV.B Matching

This is no longer operative.

IV.C Future Payments

One module, III.A.3 may require payments in the future. If one of these questions is selected (randomly) for payment, the payment should occur on the date specified in the question. That is, we will need from YouGov the date on which a payment should be made.

IV.D Question Ordering and Randomization

There should be some randomization, but there are limits. In particular, we indicate by “random1” any (randomly selected, with equal probability, without replacement) member of {III.A, III.Y, III.X}, and by “random2” any (randomly selected, with equal probability, without replacement) member of {III.D,III.E}. Then the ordering should be:

random2, random1, random1, random1, random2, III.L, and III.M

Note that this leads to 12 different possible orderings.

IV.E Moving through the Survey

Respondents must answer all questions before proceeding to the next page. Note that when an MPL is used, answering the question does not correspond to actually filling in a box in each row, see I.D.

Respondents cannot move back once they have left a page. There is one exception to this, on the puzzle pages in Section III.L. There, the respondent should be able to hit a “back” button and revise their answers to the previous puzzles, up until the point where they are asked the number they think they got correct. For more on this, see Section III.L.

IV.F Progress

There is no need for progress indicators given the short length of the survey.

IV.G Sample Size

We would like 1,000 unique links, although it is unlikely we will use more than 200 of them.

IV.H Background Variables and Additional Data from YouGov

IV.H.1 Additional Data

In addition to the answers to all questions (it is preferable if MPLs are sent to us as columns indicating the right and left hand side answers, as currently done), we would like the following information for each question:

- Question Order (if randomized, see Section IV.D)
- Points that would have been received in that question if it had been randomly chosen for payment

- Time to answer and click through that question

Both the points and time should be given for each sub-question in Section III.A.