Appendix of Supplementary Content

A.1 Introduction

This paper contains some supplementary content to "Social Preferences and Voting: An Exploration Using a Novel Preference Revealing Mechanism" by Messer, Poe, Rondeau, Schulze, and Vossler. Section A.2 describes the proposition that, for a purely self-interested maximizing agent, $B_i^* = \pi_i$ is a weakly dominant strategy for the RPVM. The experiment instructions for the RPVM in a WTP setting and in a WTA setting comprise Sections A.3 and A.4, respectively. Section A.5 describes the dichotomous voting experiments and compares the results to the RPVM. The instructions for the dichotomous choice experiments are in Section A.6. Section A.7 presents an integrated economic model of social preferences.

A.2. Proposition: For a purely self-interested expected-utility-maximizing agent, $B_i^* = \pi_i$ is a weakly dominant strategy for the RPVM.

The proof proceeds from a standard second price argument. To establish that $B_i^* = \pi_i$ is a weakly dominant strategy, it suffices to establish that $EU_i(B_i = \pi_i, B_{-i}) \geq EU_i(B_i \neq \pi_i, B_{-i}) \forall B_{-i}$ where B_{-i} denotes a vector of strategies chosen by the *N*-1 other players. We proceed by considering deviations from the strategy $B_i = \pi_i$ in relationship to whether the deviation modifies the player's status as median voter (or not).[1]

Suppose that player *i* bids $B_i = \pi_i$. Player *i* can either have the median bid or not and any deviation from $B_i = \pi_i$ can either change the value of the median bid or not. Consider a deviation bid $\tilde{B}_i > \pi_i$. If the new bid increases the value of the median bid, it increases the probability that the program will be implemented, but the increase in the probability of funding the program is entirely associated with cases where $C > \pi_i$. This necessarily lowers the expected utility of player *i*. If $\tilde{B}_i > \pi_i$ does not change the value of the median bid, it leaves the probability of implementation and the expected utility of player *i* unchanged. Hence, an increase in player *i*'s bid from $B_i = \pi_i$ either reduces $EU_i(B_i, B_{-i})$ or leaves it unchanged.

A similar argument can be made for a deviation that lowers player *i*'s bid from $B_i = \pi_i$. If the deviation decreases the value of the median bid, it lowers the probability that the program will be implemented. But all values of *C* that would previously have implemented the program but no longer do are such that $C < \pi_i$ and are thus desirable programs. The reduced probability of a desirable program being implemented decreases the expected utility of player *i*. If the deviation does not change the value of the median bid, the alternative strategy does not modify player *i*'s expected utility.

[1] Experimental papers by Tyran (2004) and Tyran and Sausgruber (2006) have examined the question of whether a voter, who may believe that for a range of possible cost amounts her vote will not be pivotal, will then alter her voting behavior without consequence (i.e., appear altruistic). These papers have found little evidence to support this type of "expressive voting" behavior.

It follows that departing from the strategy $B_i = \pi_i$ always results in either no change or in a reduction in the expected utility of player *i*. $B_i = \pi_i$ is therefore a weakly dominant strategy. With all players postulated to be self-interested and with an increasing utility function, all other players also have a weakly dominant strategy to play $B_j = \pi_j$. This establishes that truthful revelation by all players is a Bayesian Nash Equilibrium of the RPVM game.

We have already alluded to the fact that truthful revelation is not the only equilibrium of the RPVM game. The set of equilibria is very large since it includes strategy profiles where individual choices can be weakly dominated for some (and even for all) players. The problem of multiple equilibria arises directly from the median voter structure of majority voting.

For a simple example, consider the three-player game where the common induced value is $5. We have already established that the strategy profile [$5, $5, $5] is an equilibrium but so are the profiles [$5, $5, $1] and [$2, $2, $2]. In both cases, all players are providing best responses to the strategies of the other two players and neither can increase his expected payoff. The last scenario is particularly disturbing since it is socially inefficient.

A.3 Experiment Instructions – RPVM Willingness to Pay

Instructions – Part A

This is an experiment in the economics of decision making. In the course of the experiment, you will have opportunities to earn money. Any money earned during this experiment is yours to keep. It is therefore important that you read these instructions carefully. Please do not communicate with other participants during the experiment.

In today's experiment, you will be asked to indicate the highest amount of money you would pay and still vote for different programs. In this experiment, a *program* is simply a distribution of money. As you will see, the amount that you indicate as the highest amount that you would pay for the program will become a vote in favor or against the program and will determine whether or not the program is funded. It is therefore important that you consider all of the information given to you about the different programs and that you make judicious decisions. The procedures that will be followed are the same for all programs. However, each program and vote is independent from the other. Therefore, the decisions you make and the result of a vote for one program will not affect the results for other programs.

For each program, the experiment proceeds as follows:

First, you will receive an initial balance of $10.00.

You will then be informed of your "personal loss amount" for this program. Your personal loss amount is the amount of money that you will lose if the program is **not funded**. Your personal loss amount will vary during the course of the experiment. The possible amounts are minus $2.00, minus $5.00, and minus $8.00.

You will then be asked to write down the highest amount that you would pay and still vote for this program; we will call this your "bid." For each program, you can bid any amount between $0.00 and your initial balance of $10.00. Once you have decided your bid, you will write it on a Voting Sheet and enter it into the computer spreadsheet. We will then collect the Voting Sheets and determine the cost of the program.

The cost of the program will be determined by reading off three numbers from a random number table. The starting number will be determined by dropping a pen onto the random number table. (If more than one mark occurs from the drop, then the one closest to the upper-left corner will be used.) The numbers will be read from left to right on the table. The first number will represent the dollar amount. The second number will represent the dime amount. The third number will represent the penny amount. Together, the three numbers will form a cost between $0.00 and $9.99. Note: since these numbers have been generated by a random number table, each cost between $0.00 and $9.99 is equally likely. Once the cost has been determined, you will be asked to enter it into the spreadsheet on your computer.

Whether or not the program is funded depends on the amount of your bid and the cost of the program. There are two possible outcomes:

The program is NOT FUNDED: The program is not funded if your bid is *less than* the cost determined from the random number table. In this case, you will not pay the cost but you will pay your personal loss amount. Therefore, your earnings would be initial balance of $10.00 minus the loss amount.

The program is FUNDED: The program is funded if your bid is *equal to or greater than* the cost determined from the random number table. In this case, you pay the determined cost but do not pay your personal loss amount. Therefore, your earnings would be initial balance of $10.00 minus the determined cost.

Note how your bid is like a vote for or against funding the program. With your bid, you are writing down the highest amount you would pay and still vote for the program. Therefore, your bid is like a vote in favor of the program if you are prepared to pay an amount equal to or greater than the randomly determined cost. On the other hand, your bid is like a vote against the program if your bid turns out to be less than the cost. Since you are the only voter, your bid will determine whether the program is funded or not.

While your bid helps determine whether the program is funded or not, your earnings for a particular program are based on your initial balance, your personal loss amount, and the determined cost. For example, if a program was *not funded* and your personal loss amount was minus $5.00 and the determined cost was $9.00, your earnings would be $5.00 ($10 – $5). However, if the program was *funded* with the same personal loss amount and determined cost, your earnings would be $1.00 ($10 – $9). Consider another example where your personal loss amount was minus $5.00 and the determined cost was $2.00. In this example, if the program was *not funded* your earnings would be $5.00 ($10 – $5) while if the program was *funded*, your earnings would be $8.00 ($10 – $2).

Calculation of Your Earnings

Once you enter the cost of the program determined from the random number table, the computer will automatically determine whether the program was funded and calculate your earnings. The computer will add your experimental earnings for all of the programs and convert this amount to U.S. dollars by applying an exchange rate of one U.S. dollar for fifteen experimental dollars. For example, if you earn $230.45 experimental dollars, your monetary payoff from this part of the experiment would be $15.50. At the end of the experiment, we will audit all of the spreadsheets to ensure accuracy.

It is important that you clearly understand these instructions.
Please raise your hand if you have any questions.
Please do not talk with other participants in the experiment.

Instructions – Part B

You will now be asked to indicate how much you would pay for each of nine separate programs. The procedures are similar to the ones used in Part A of the experiment except for three important differences.

1) For each of the programs, you may be the only voter (as in the first part of the experiment), but you may also be part of a group of three voters. For programs where the group size is three, the personal loss amounts that the other voters in your group will pay if the program is not funded are indicated on your Voting Sheet.

2) Only one of the nine programs will actually be implemented and result in cash earnings. Therefore, all votes will be made prior to determination of any costs. At the conclusion of the experiment, we will randomly determine which of the programs will generate cash earnings by drawing from a bag containing nine chips lettered A through I that correspond to each of the programs.

3) For the program that generates cash earnings, the exchange rate will be one U.S. dollar for one experimental dollar. For example, if you earn $12.25 experimental dollars in the second part of the experiment, your monetary payoff would be $12.25.

For each program, the experiment proceeds as follows:

You and every other member of your group will receive an initial balance of $10.00.

For the nine programs, your personal loss amount may be minus $2.00, minus $5.00, or minus $8.00. Other participants will also receive one of these three loss amounts and you will be informed of these amounts.

For each program, you will be asked to write your bid on the Voting Sheet provided and enter the same amount into the second spreadsheet on the computer. You can bid any amount between $0.00 and your initial balance of $10.00.

Once everyone has written down his/her bid and entered the bid into the computer, we will collect the Voting Sheets and distribute the new Voting Sheets for the next program.

While we will not implement the program until the end of the experiment, please note that the cost for the program will be determined in the same manner as in Part A using a new random number table. However, the cost will now be a cost that each person in your group will have to pay if the program is funded.

Whether or not the programs are funded depends on the bids by members of your group and the cost of the particular program. There are two possible outcomes:

The program is NOT FUNDED: The program is not funded if the majority of bids from your group are *less than* the cost determined from the random number table. In this case, neither you nor any other member of your group pay the cost but everyone pays his/her personal loss amount. Therefore, your earnings would be your initial balance of $10.00 minus the loss amount.

The program is FUNDED: The program is funded if the majority of bids from your group are *equal to or greater than* the cost determined from the random number table. In this case, you and every other member of your group pay the determined cost but no one pays his/her personal loss amount. Therefore, your earnings would be your initial balance of $10.00 minus the determined cost.

The programs in which you are a group of one are identical to the programs you experienced in the first part of the experiment. Therefore, the program is not funded if your bid is *less* than the cost determined from the random number table and program is funded if your bid is *equal to or greater than* the determined cost.

Note once again how your bid is like a vote for or against funding the program. With your bid, you are writing down the highest amount you would pay and still vote for the program. Therefore, your bid is like a vote in favor of the program if you are prepared to pay an amount equal to or greater than the randomly determined cost. On the other hand, your bid is like a vote against the program if it turns out to be less than the cost. When the majority of bids are equal to or greater than the determined cost, this translates into a majority vote in favor of the program. Similarly, a majority of bids below the cost translates into a majority vote against the program at that cost.

It is important that you clearly understand these instructions.
Please raise your hand if you have any questions.
Please do not talk with other participants in the experiment.

Instructions – Part C

Similar to Part A, you will again be asked to indicate the highest amount of money you would pay and still vote for different programs. However, in this part you will be informed of your "personal *payoff* amount" instead of your "personal *loss* amount." Your personal payoff amount is the amount of money that you will receive if the program is **funded**. Your personal payoff amount will vary during the course of the experiment. The possible payoff amounts are $2.00, $5.00, and $8.00.

The two possible outcomes are as follows:

The program is NOT FUNDED: The program is not funded if your bid is *less than* the cost determined from the random number table. In this case, you will not receive your personal payoff amount and you will not have to pay the cost. Therefore, your earnings for this portion of the experiment would simply be your initial balance of $10.00.

The program is FUNDED: The program is funded if your bid is *equal to or greater than* the cost determined from the random number table. In this case, you will receive your personal payoff amount in addition to your initial balance. However, you will also have to pay the determined cost. Therefore, your cash earnings for this portion of the experiment would be your initial balance ($10.00) plus your personal payoff amount minus the cost.

For example, if a program was *not funded* and your personal payoff was $5.00 and the determined cost was $9.00, your earnings would be $10.00. However, if the program was *funded* with the same personal payoff and cost, your earnings would be $6.00 ($10 + $5 – $9). Consider another example where your personal payoff was $5.00 and the determined cost was $2.00. In this example, if the program was *not funded* your earnings would again be $10.00 while if the program was *funded*, your earnings would be $13.00 ($10 + $5 – $2).

Calculation of Your Earnings

Similar to Part A, the computer will automatically determine your earnings and the exchange rate will again be one U.S. dollar for fifteen experimental dollars.

Instructions – Part D

Similar to Part B, you again will now be asked to indicate how much you would pay for each of nine separate programs. Again the exchange rate is one experimental dollar equaling one U.S. dollar and all other procedures are identical to those of Part B except that now you will have personal payoff amounts of $2.00, $5.00, and $8.00. For these programs, other participants will also receive one of these three payoff amounts.

After all of the Voting Sheets have been collected, a program from Part D will be selected for implementation by drawing from a bag containing nine chips lettered J through R that

correspond to each of the programs. At that time we will also implement and produce cash earnings for Part B.

For Part D, there are two possible outcomes:

The program is NOT FUNDED: The program is not funded if the majority of bids from your group are *less than* the cost determined from the random number table. In this case, neither you nor any other member of your group will receive a personal payoff amount and no one will pay the cost. Therefore, your cash earnings for this part of the experiment would simply be your initial balance of $10.00.

The program is FUNDED: The program is funded if the majority of bids from your group are *equal to or greater than* the cost determined from the random number table. In this case, you will receive your personal payoff amount in addition to your initial balance. However, you will also have to pay the randomly determined cost. Every other member of your group will also receive their personal payoff amounts and they will also have to pay the determined cost. Therefore, your cash earnings would be your initial balance ($10.00) plus your personal payoff amount minus the cost.

Calculation of Final Earnings

To calculate your earnings from Part D and Part B, you will be asked to enter into the spreadsheet the cost for the implemented programs and that these programs were funded. Your computer will then calculate your earnings for Part D and Part B, add them to your earnings from Part A and Part C, and award you an additional $5 show-up fee. We will audit the spreadsheets to ensure accuracy.

A.4 Experiment Instructions. RPVM Willingness to Accept

Instructions – Part A

This is an experiment in the economics of decision making. In the course of the experiment, you will have opportunities to earn money. Any money earned during this experiment is yours to keep. It is therefore important that you read these instructions carefully. Please do not communicate with other participants during the experiment.

In today's experiment, you will be asked to indicate the lowest amount of money you would accept as compensation and still vote against different programs. In this experiment, a *program* is simply a distribution of monetary gain. As you will see, the amount that you indicate as the lowest amount of compensation that you would accept for the program will become a vote in favor or against the program and will determine whether or not the program is implemented. It is therefore important that you consider all of the information given to you about the different programs and that you make judicious decisions. The procedures that will be followed are the same for all programs. However, each program and vote is independent from the other.

Therefore, the decisions you make and the result of a vote for one program will not affect the results for other programs.

For each program, the experiment proceeds as follows:

First, you will receive an initial balance of $5.00.

You will then be informed of your "personal payoff amount" for this program. Your personal payoff amount is the amount of money that you will receive if the program is **implemented**. Your personal payoff amount will vary during the course of the experiment. The possible payoff amounts are $2.00, $5.00, and $8.00.

You will then be asked to write down the lowest amount that you would accept as compensation and still vote against this program; we will call this your "offer." For each program, you can offer any amount between $0.00 and $10.00. Once you have decided your offer, you will write it on a Voting Sheet and enter it into the computer spreadsheet. We will then collect the Voting Sheets and determine the compensation for the program.

The **compensation** for the program will be determined by reading off three numbers from a random number table. The starting number will be determined by dropping a pen onto the random number table. (If more than one mark occurs from the drop, then the one closest to the upper-left corner will be used.) The numbers will be read from left to right on the table. The first number will represent the dollar amount. The second number will represent the dime amount. The third number will represent the penny amount. Together, the three numbers will form a compensation amount between $0.00 and $9.99. Note: since these numbers have been generated by a random number table, each compensation amount between $0.00 and $9.99 is equally likely. Once the compensation has been determined, you will be asked to enter it into the spreadsheet on your computer.

Whether or not the program is implemented depends on the amount of your offer and the compensation for the program. There are two possible outcomes:

The program is NOT IMPLEMENTED: The program is not implemented if your offer is *equal to or less than* the compensation determined from the random number table. In this case, you do not receive your personal payoff amount but you do receive the compensation. Therefore, your earnings for this portion of the experiment would be your initial balance of $5.00 plus the compensation.

The program is IMPLEMENTED: The program is implemented if your offer is *greater than* the compensation determined from the random number table. In this case, you will receive your personal payoff amount in addition to your initial balance. Therefore, your cash earnings for this portion of the experiment would be your initial balance ($5.00) plus your personal payoff amount.

Note how your offer is like a vote for or against implementing the program. With your offer, you are writing down the lowest amount of compensation you would accept to vote against the

program. Therefore, your offer is like a vote against the program if your offer turns out to be equal to or less than the randomly determined compensation. On the other hand, your offer is like a vote in favor of the program if your offer turns out to be more than the compensation. Since you are the only voter, your offer will determine whether the program is implemented or not.

While your offer helps determine whether the program is implemented or not, your earnings for a particular program are based on your initial balance, your personal payoff amount, and the determined compensation. For example, if a program was *not implemented* and your personal payoff was $5.00 and the determined compensation was $9.00, your earnings would be $14.00 ($5 + $9). However, if the program was *implemented* with the same personal payoff and compensation, your earnings would be $10.00 ($5 + $5). Consider another example where your personal payoff was $5.00 and the determined compensation was $2.00. In this example, if the program was *not implemented* your earnings would again be $7.00 ($5 + $2) while if the program was *implemented*, your earnings would be $10.00 ($5 + $5).

Calculation of Your Earnings

Once you enter the compensation of the program determined from the random number table, the computer will automatically determine whether the program was implemented and calculate your earnings. The computer will add your experimental earnings for all of the programs and convert this amount to U.S. dollars by applying an exchange rate of one U.S. dollar for fifteen experimental dollars. For example, if you earn $230.45 experimental dollars, your monetary payoff from this part of the experiment would be $15.50. At the end of the experiment, we will audit all of the spreadsheets to ensure accuracy.

It is important that you clearly understand these instructions.
Please raise your hand if you have any questions.
Please do not talk with other participants in the experiment.

Instructions – Part B

You will now be asked to indicate the lowest amount of compensation you would accept for each of nine separate programs. The procedures are similar to the ones used in Part A of the experiment except for three important differences.

1) For each of the programs, you may be the only voter (as in the first part of the experiment) but you may also be part of a group of three voters. For programs where the group size is three, the personal payoff amounts that the other voters in your group will receive if the program is not implemented are indicated on your Voting Sheet.

2) Only one of the nine programs will actually be selected and result in cash earnings. Therefore, all votes will be made prior to determination of any of the compensations. At the conclusion of the experiment, we will randomly determine which of the programs will generate cash earnings by drawing from a bag containing nine chips lettered A through I that correspond to each of the programs.

3) For the program that generates cash earnings, the exchange rate will be one U.S. dollar for one experimental dollar. For example, if you earn $12.25 experimental dollars in the second part of the experiment, your monetary payoff would be $12.25.

For each program, the experiment proceeds as follows:

You and every other member of your group will receive an initial balance of $5.00.

For the nine programs, your personal payoff amount may be $2.00, $5.00, or $8.00. Other participants will also receive one of these three payoff amounts and you will be informed of these amounts.

For each program, you will be asked to write your offer on the Voting Sheet provided and enter the same amount into the second spreadsheet (Sheet B) on the computer. You can offer any amount between $0.00 and $10.00.

Once everyone has written down his/her offer and entered the offer into the computer, we will collect the Voting Sheets and distribute the new Voting Sheets for the next program.

While we will not select the program until the end of the experiment, please note that the compensation for the program will be determined in the same manner as in Part A using a new random number table. However, the compensation will now be received by each person in your group if the program is not implemented.

Whether or not the programs are implemented depends on the offers by members of your group and the compensation of the particular program. There are two possible outcomes:

The program is NOT IMPLEMENTED: The program is not implemented if the majority of offers from your group are *equal to or less than* the compensation determined from the random number table. In this case, neither you nor any other member of your group will receive a personal payoff amount but everyone will receive the compensation. Therefore, your cash earnings for this part of the experiment would be your initial balance of $5.00 plus the compensation.

The program is IMPLEMENTED: The program is implemented if the majority of offers from your group are *greater than* the compensation determined from the random number table. In this case, you and everyone else in your group will receive their personal payoff amount in addition to the initial balance. Therefore, your cash earnings would be your initial balance ($5.00) plus your personal payoff amount.

The programs in which you are a group of one are identical to the programs you experienced in the first part of the experiment. Therefore, the program is implemented if your offer is *greater than* the compensation determined from the random number table and the program is not implemented if your offer is *equal to or less than* the determined compensation.

Note once again how your offer is like a vote for or against implementing the program. With your offer, you are writing down the lowest amount of compensation you would accept and still vote against the program. Therefore, your offer is like a vote against the program if your offer is equal to or less than the randomly determined compensation. On the other hand, your offer is like a vote in favor of the program if the randomly determined compensation turns out to be more than your offer. When the majority of offers are equal to or less than the determined compensation, this translates into a majority vote against the program. Similarly, a majority of offers greater than the compensation translates into a majority vote in favor of the program for that compensation.

It is important that you clearly understand these instructions.
Please raise your hand if you have any questions.
Please do not talk with other participants in the experiment.

Instructions – Part C

Similar to Part A, you will again be asked to indicate the lowest amount of compensation you would accept in different programs. However, in this part your offer is the lowest amount of compensation you would accept to vote *in favor* of the program. In addition, you will be informed of your "personal *loss* amount" instead of your "personal *payoff* amount." Your personal loss amount is the amount of money that you will lose if the program is **implemented**. Your personal loss amount will vary during the course of the experiment. The possible loss amounts are minus $2.00, minus $5.00, and minus $8.00.

The two possible outcomes are as follows:

The program is IMPLEMENTED: The program is implemented if your offer is *less than or equal to* the compensation determined from the random number table. In this case, you will receive the determined compensation in addition to your initial balance. However, you will also have to pay your personal loss amount. Therefore, your earnings for this portion of the experiment would be your initial balance ($5.00) plus the compensation minus your personal loss amount.

The program is NOT IMPLEMENTED: The program is not implemented if your offer is *greater than* the compensation determined from the random number table. In this case, you do not receive the random compensation or pay your personal loss amount. Therefore, your earnings for this portion of the experiment would simply be your initial balance of $5.00.

For example, if a program was *not implemented* and your personal loss amount was minus $5.00 and the determined compensation was $9.00, your earnings would be $5.00 (your initial balance). However, if the program was *implemented* with the same personal loss amount and determined compensation, your earnings would be $9.00 ($5 + $9 – $5). Consider another example where your personal loss amount was minus $5.00 and the determined compensation was $2.00. In this example, if the program was *not implemented* your earnings would again be $5.00 while if the program was *implemented*, your earnings would be $2.00 ($5 + $2 – $5).

Calculation of Your Earnings

Similar to part A, the computer will automatically determine your earnings and the exchange rate will again be one U.S. dollar for fifteen experimental dollars.

Instructions – Part D

Similar to Part C, you again will now be asked to indicate the lowest amount of compensation you would accept for each of nine separate programs. Again the exchange rate is one experimental dollar equaling one U.S. dollar and all other procedures are identical to those of Part B except that now you will have personal loss amounts of minus $2.00, minus $5.00, and minus $8.00. For these programs, other participants will also receive one of these three loss amounts.

After all of the Voting Sheets have been collected, a program from Part D will be selected by drawing from a bag containing nine chips lettered J through R that correspond to each of the programs. At that time we will also select and produce cash earnings for Part B.

For Part D, there are two possible outcomes:

The program is IMPLEMENTED: The program is implemented if the majority of offers from your group are *less than or equal to* the compensation determined from the random number table. In this case, you and every other member of your group will receive the determined compensation in addition to your initial balance. However, everyone will also have to pay their personal loss amounts. Therefore, your earnings for this portion of the experiment would be your initial balance ($5.00) plus the compensation minus your personal loss amount.

The program is NOT IMPLEMENTED: The program is not implemented if the majority of the offers from your group are *greater than* the compensation determined from the random number table. In this case, neither you nor any member of your group will receive the random compensation nor pay your personal loss amount. Therefore, your earnings for this portion of the experiment would simply be your initial balance of $5.00.

Calculation of Final Earnings

To calculate your earnings from Part D and Part B, you will be asked to enter into the spreadsheet the compensation for the implemented programs and that these programs were implemented. Your computer will then calculate your earnings for Part D and Part B, add them to your earnings from Part A and Part C, and award you an additional $5 show up fee. We will audit the spreadsheets to ensure accuracy.

A.5 A Comparison of Dichotomous Voting with the RPVM

Experimental Design

To investigate the relevance of the RPVM results, we conduct targeted comparisons with experimental dichotomous choice referenda. In particular, we investigate whether groups with heterogeneous induced values in a WTP-Gains setting exhibit behavior consistent with social efficiency preferences. These additional experiments employ the ($2, $5, $8) distribution and the same universe of volunteer students. One hundred and seventy four students participated in these experiments.

Subjects received written instructions (Section A.6 of the Appendix of Supplementary Content) and were permitted to ask questions at the beginning of the experiment. Subjects were randomly placed in groups of three voters and given an initial endowment of $10. In each vote, each subject was assigned one of three possible induced values: $2, $5, or $8, which was the amount that the individual would receive if the majority of group members vote in favor. Each participant made six confidential and independent voting decisions where her own value, the values of other group members, and the implementation cost varied across decisions. After all of the votes were cast, a volunteer subject randomly selected one of these voting decisions to generate payoffs. No exchange rate was used in these experiments.

As shown in Table A1, in the "heterogeneous distribution design" participants cast votes for programs with heterogeneous distributions of values (one subject each with values of $2, $5, and $8) when the uniform cost was $2.50 and $7.50. In the other set of sessions, referred to as the "homogeneous distribution design," participants first cast three votes for programs with homogeneous distributions of values (for example, each subject had a value of $2) and then cast another three votes for programs with heterogeneous distributions of values where the uniform cost was near the induced value of $5. The order of decisions in both designs was reversed to control for potential order effects.

The uniform costs (taxes) were set to favor detection of social efficiency preference behavior based on the results of the RPVM experiments previously described. A $7.50 cost was used to examine the behavior of voters with an induced value of $8, costs of $4.50 or $5.50 were imposed on participants with a $5 induced value, and a $2.50 cost was utilized to examine responses from those with a $2 induced value. An area of future research would be to examine behavior in a dichotomous voting setting where the costs were further away from the induced value.

Results

Direct comparisons can be made between the dichotomous choice results and treatments from the RPVM WTP-Gains experiment that use the ($2, $5, $8) value distribution. First, we find a close correspondence between dichotomous choice voting at a particular cost and the number of RPVM subjects who bid at or above that same cost (and are thus indicating they would vote "yes" at this cost). For example, 23.7% of RPVM subjects with a $2 value indicated that they would pay at least $2.50 in the heterogeneous value setting. This percentage is statistically indistinguishable from the 18.6% of subjects who voted yes in the similar dichotomous choice

setting (p = 0.410). None of the dichotomous choice voting treatments yielded results that were statistically different than the results of the RPVM.[2]

Second, the differences between RPVM homogeneous and heterogeneous treatments mirror those found for dichotomous choice referenda. For $2 value subjects, a statistically higher percentage of subjects in heterogeneous value treatments bid at or above $2.50 ($p$ = 0.004). This difference across treatments, –11.9%, is quite similar to the –12.9% difference in the dichotomous choice experiment. For $8 value subjects, a statistically different and lower percentage of subjects in heterogeneous value treatments bid at or above $7.50 ($p$ = 0.003). This difference across RPVM treatments, 10.8%, is quite similar to the 13.1% difference in the dichotomous choice experiment. Similar to dichotomous choice, no difference across RPVM treatments is found for $5 subjects at costs of $4.50 (3.2% difference, similar to 4.0% in dichotomous choice) (p = 0.320) or $5.50 (–4.3% difference, similar to –7.7% in dichotomous choice) (p = 0.320). Thus, overall, there is a very close correspondence between dichotomous choice referenda voting and RPVM bidding, both in levels and in terms of homogeneous versus heterogeneous treatment differences. Thus, we cannot reject the hypothesis that the RPVM predicts voting patterns in dichotomous choice voting.

A.6 Experiment Instructions – Dichotomous Choice Voting

This is an experiment in the economics of decision making. In the course of the experiment, you will have opportunities to earn money. Any money earned during this experiment is yours to keep. It is therefore important that you read these instructions carefully. Please do not communicate with other participants during the experiment.

In today's experiment, you will be asked to **vote** for or against six different **programs**. In this experiment, a program is simply a distribution of money. As you will see, your vote will help determine whether or not the program is **funded**. The procedures that will be followed are the same for all programs. However, each program and vote is independent from the other. Therefore, your vote in one program will not affect the results for other programs.

Only one of the six programs will actually be implemented and result in cash earnings. At the conclusion of the experiment, we will randomly determine which of the programs will generate cash earnings by drawing from a bag containing six chips lettered A through F that correspond to each program.

For each program, the experiment proceeds as follows:

For each of the programs, you will be part of a group of three voters. First, you and every other member of your group will receive an **initial balance** of $10.00.

You will then be informed of your **personal payoff amount** for this program. Your personal payoff amount is the amount of money that you will receive if the program is funded. Your

[2] The differences between comparable dichotomous choice heterogeneous and homogeneous treatments are statistically different from zero (similar to RPVM). For the $2 value, the difference of 12.9% is significant at $p < 0.01$. For the $8 value, the difference of 13.1% is significant at $p = 0.03$.

personal payoff amount will vary during the course of the experiment. The possible amounts are $2.00, $5.00, and $8.00. The payoff amounts that the other voters in your group will receive if the program is funded are indicated on your computer spreadsheet. Your spreadsheet also will inform you of the **per person cost** of the program. This is the cost that you and everyone else in your group would have to pay if the program is funded.

You will then be asked to vote for ("Yes") or against ("No") this program. You will submit your vote by clicking the "Submit" button. For each program, there are two possible outcomes:

The program is NOT FUNDED: The program is not funded if the majority of votes from your group are "No." In this case, neither you nor any other member of your group will receive a personal payoff amount and no one will pay the cost. Therefore, your cash earnings for this part of the experiment would simply be your initial balance of $10.00.

The program is FUNDED: The program is funded if the majority of votes from your group are "Yes." In this case, you will receive your personal payoff amount in addition to your initial balance. However, you will also have to pay the per person cost. Every other member of your group will also receive their personal payoff amounts and they will also have to pay the same per person cost. Therefore, your cash earnings would be your initial balance ($10.00) plus your personal payoff amount minus the per person cost.

At the conclusion of the experiment, a volunteer subject will draw to determine which of the six programs will be implemented to determine your cash payoff. Upon notification by the administrator, please click the "Update Results" button.

References

Tyran, Jean-Robert. "Voting When Money and Morals Conflict. An Experimental Test of Expressive Voting." *Journal of Public Economics*, 2004, 88(7): 1645–1664.

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Table A1: Dichotomous Choice Experiment

Heterogeneous Distribution Design *(n = 86)*

Session A

Treatment	Initial Endowment	Own Benefit	Others' Benefits	Uniform Cost	Expected Earnings
1st	$10	$2	$5, $8	$2.50	$ 9.50
2nd	$10	$8	$2, $5	$7.50	$10.00
3rd	$10	$5	$2, $8	$2.50	$12.50
4th	$10	$8	$2, $5	$2.50	$15.50
5th	$10	$2	$5, $8	$7.50	$10.00
6th	$10	$5	$2, $8	$7.50	$10.00

Session B

Treatment	Initial Endowment	Own Benefit	Others' Benefits	Uniform Cost	Expected Earnings
1st	$10	$8	$2, $5	$7.50	$10.00
2nd	$10	$2	$5, $8	$2.50	$ 9.50
3rd	$10	$5	$2, $8	$7.50	$10.00
4th	$10	$2	$5, $8	$7.50	$10.00
5th	$10	$8	$2, $5	$2.50	$15.50
6th	$10	$5	$2, $8	$2.50	$12.50

Homogeneous Distribution Design *(n = 88)*

Session A

Treatment	Initial Endowment	Own Benefit	Others' Benefits	Uniform Cost	Expected Earnings
1st	$10	$2	$2, $2	$2.50	$10.00
2nd	$10	$8	$8, $8	$7.50	$10.50
3rd	$10	$2	$5, $8	$4.50	$ 7.50
4th	$10	$5	$2, $8	$4.50	$10.00
5th	$10	$8	$2, $5	$4.50	$13.50
6th	$10	$5	$5, $5	$4.50	$10.00

Session B

Treatment	Initial Endowment	Own Benefit	Others' Benefits	Uniform Cost	Expected Earnings
1st	$10	$8	$8, $8	$7.50	$10.50
2nd	$10	$2	$2, $2	$2.50	$10.00
3rd	$10	$8	$2, $5	$5.50	$10.00
4th	$10	$5	$2, $8	$5.50	$10.00
5th	$10	$2	$5, $8	$5.50	$10.00
6th	$10	$5	$5, $5	$5.50	$10.00

A.7 Integrated Econometric Model of Social Preferences

This model follows that of Engelmann and Strobel (*AER*, 2004) closely. Engelmann and Strobel appropriately use a conditional logit model. In their dictator game the dictator has a choice among different (and known) payoff distributions and the conditional logit is motivated by a RUM framework wherein the dictator chooses the distribution that yields the highest utility. In our RPVM setting, the voter does not directly choose the payoff allocation but instead reveals her preferences by submitting a bid. We thus use a linear regression model of voter bids rather than a conditional logit model of choices.

Let i denote the individual, j denote the experimental treatment, x_{ij} denote the induced value of subject i in treatment j, and k denote the members of a particular grouping of individuals. We posit the following linear relationship:

$$Bid_{ij} = \gamma_0 + \gamma_1 Eff_{ij} + \gamma_2 MM_{ij} + \gamma_3 Self_{ij} + \gamma_4 FSstrict_{ij} + \gamma_6 ERC_{ij} + \varepsilon_{ij}$$

where

$$Eff_{ij} = \sum_{k \neq i} x_{kj}$$

$$MM_{ij} = \min\{x_{kj}\}$$

$$Self_{ij} = x_{ij}$$

$$FSstrict_{ij} = -\frac{1}{2}\sum_{k \neq i} max\{x_{kj} - x_{ij}, 0\} - \frac{1}{2}\sum_{k \neq i} max\{x_{ij} - x_{kj}, 0\}$$

$$ERC_{ij} = -\left| x_{ij} - \frac{1}{3}\sum_{k} x_{kj} \right|.$$

Our efficiency and ERC variables differ from Engelmann and Strobel and this is due to differences across the dictator game and RPVM settings (our variables are consistent with the bid functions presented in our Table 1). Stata output (for pooled WTA and WTP) appears below.

```
. regress bid eff mm self fsstrict erc if(het==1)

      Source |       SS       df       MS              Number of obs =    2196
-------------+------------------------------           F(  5,  2190) =  529.32
       Model |   8927.5575     5   1785.5115           Prob > F      =  0.0000
    Residual |  7387.38928  2190  3.37323712           R-squared     =  0.5472
-------------+------------------------------           Adj R-squared =  0.5462
       Total |  16314.9468  2195  7.43277758           Root MSE      =  1.8366

------------------------------------------------------------------------------
         bid |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         eff |   .0787966    .020717     3.80   0.000     .0381697    .1194235
          mm |  -.0184271   .0141725    -1.30   0.194    -.0462201    .0093658
        self |   .8935197   .0229129    39.00   0.000     .8485864     .938453
    fsstrict |  -.0264339   .0875551    -0.30   0.763    -.1981336    .1452658
         erc |   .0247638    .064094     0.39   0.699    -.1009276    .1504552
       _cons |  -.1658653   .3614509    -0.46   0.646    -.8746879    .5429572
------------------------------------------------------------------------------
```