Web Appendix for

Are Reference Points Merely Lagged Beliefs Over Probabilities?

Ori Heffetz

June 9, 2018

Appendix A: Study 1 Instruments Example

[Instructions start on the next page.]

Instructions

Thank you for participating in this study.

Please do not skip ahead in the instructions, and do not turn a page before you have completed it. Once you have written something down, please do not go back to change it.

If you have a question, please raise your hand and one of the monitors will come to you to answer your question. Please refrain from communicating with the other people in the room, and please do not discuss the procedures of the study with people outside this room.

We will start by flipping a coin. Please raise your hand and wait for the monitor to come and give you a coin to flip. After flipping it, check one box below, according to the coin-flip outcome. “Heads” is the side with the picture; “tails” is the side with the coin value.

Coin flip:

- ☐ Heads
- ☐ Tails

Please wait for the monitor. After the coin flip, please record your answer by checking one box above before continuing with the instructions. Try to remember the flip’s result – it will be important.

In front of you are two items — a chocolate bar and a water bottle. Your coin-flip has determined which one of them belongs to you as a gift to take home. Whether or not you can choose to exchange your item for the other item is determined at random, as explained below in detail.

In brief, you own the bottle if you flipped "heads" and the chocolate if you flipped "tails." The item you own is yours to keep. You own it for real, not just for the purpose of the study.

There is a onefive-in-six probability (that is $\frac{1}{6}\frac{5}{6}$, or about 17%83%) that you will be able to exchange it for the other item if you want to. However, there is a fiveone-in-six probability (that is $\frac{5}{6}\frac{1}{6}$, or about 83%17%) that you will NOT be able to exchange it.

Remember that everything written in these instructions is real: you will actually leave the room at the end of the session with one of the two items. Feel free to inspect the items but please return them both to their places before we continue.

Please inspect the items but set them back before continuing with the instructions.

In the end of the study, before you leave with one of the items, a die roll will determine if you can exchange the item you own for the other item. That part of the study will be carried out as follows:

1) We will ask you to choose whether you want to keep the item you own, or to exchange it for the other item.
2) We will ask you to roll a six-sided die.

If the outcome of the die isis not 4, you will take home the item determined by your choice in (1). That is, if you have just chosen to keep the item you own, you will take it home; and if you have just chosen to exchange it, you will take home the other item.

If the outcome of the die is notis 4, you will take home the item you own.

Remember that which item you own was determined by the coin-flip: you own the bottle if you flipped "heads" and the chocolate if you flipped "tails."

Notice that you have a onefive-in-six (or about 17%83%) chance to be able to exchange your item. In other words, there is a pretty high probability that you will take home the item you own regardless of your choice.your choice will determine which item you take home, regardless of the outcome of the coin flip. If you have any questions, please raise your hand.

You will now answer two comprehension questions to make sure that you understand exactly how the item you take home at the end of the study will be determined. Please turn to the next page to answer these questions.

Please answer the following two questions.

1. With a one-in-six chance, the outcome of the die will be 4. In that case:

   (Please check one box. If you check the bottom box, please also fill out the blank space: bottle or chocolate.)

☐ I will take home the item I choose, regardless of the coin-flip at the beginning of this study. ☐ I will take home the ________, as determined by the coin-flip at the beginning of this study, regardless of my choice.

2. With a five-in-six chance, the outcome of the die will not be 4. In that case:

   (Please check one box. If you check the bottom box, please also fill out the blank space: bottle or chocolate.)

☐ I will take home the item I choose, regardless of the coin-flip at the beginning of this study. ☐ I will take home the ________, as determined by the coin-flip at the beginning of this study, regardless of my choice.

Please raise your hand when you finish.

Please do not proceed until the monitor has verified your answers to the questions above.

Once the monitor asks you to proceed, please proceed to the next page, where the randomness of the die will be demonstrated. Following that, you will answer two sets of questions, and then you will proceed to choose whether you want to keep the item you own, or exchange it for the other item.

In this part of the study you will be asked to roll the die a few times, to demonstrate the randomness of a die roll.

In front of you are a six-sided die and two markers — one red and one blue.
The die is a fair die: the probability that it will land on any one of its sides is one in six ($\frac{1}{6}$).
Please roll the die. If the result is 4an even number, please color in blue the leftmost square below. If the result is not 4an odd number, please color in red the leftmost square below.

Now repeat this process 17 more times (overall 18 die rolls). After each roll, please color the leftmost empty square in the appropriate color. After 18 rolls, all squares should be colored.

How many squares did you color in red? ________.

How many squares did you color in blue?________.

Remember, later in the study you will be able to choose "Keep" or "Exchange." If the outcome of a subsequent die roll is 4not 4, your choice to keep or exchange will determine which item you will take with you at the end of the study. If the outcome is not 44, you will take home the item you own, regardless of your choice.

Is the ratio between blue squares and red squares larger than, smaller than, or equal to the ratio between the chance that your choice will determine which item you take home and the chance that your choice will have no effect?_______. (Write larger, smaller, or equal)

Please answer the following questions. Notice that they probe your subjective feelings regarding probabilities, using verbal expressions.

Next to each question, write down a letter that expresses your feeling regarding the chance that the relevant event will take place, according to this table:

No chance at all	Nearly no chance	Very low chance	Low chance	Slightly low chance	Neither high nor low chance	Slightly high chance	High chance	Very high chance	Nearly certain	Completely certain
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**

What is the chance that the outcome of the die will be 4? ____. (Write a letter from A to K)

What is the chance that the outcome of the die will not be 4? ____. (Write a letter from A to K)

If I choose "Keep," what is the chance that I will take home the bottle?____. (Write a letter from A to K)

If I choose "Keep," what is the chance that I will take home the chocolate?____. (Write a letter from A to K)

If I choose "Exchange," what is the chance that I will take home the bottle?____. (Write a letter from A to K)

If I choose "Exchange," what is the chance that I will take home the chocolate?____. (Write a letter from A to K)

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. **Notice that the scale now goes from 1 to 5.**

Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
1	**2**	**3**	**4**	**5**

I see Myself as Someone Who…

___1. Is talkative

___2. Tends to find fault with others

___3. Does a thorough job

___4. Is depressed, blue

___5. Is original, comes up with new ideas

___6. Is reserved

___7. Is helpful and unselfish with others

___8. Can be somewhat careless

___9. Is relaxed, handles stress well

___10. Is curious about many different things

___11. Is full of energy

___12. Starts quarrels with others

___13. Is a reliable worker

___14. Can be tense

___15. Is ingenious, a deep thinker

___16. Generates a lot of enthusiasm

___17. Has a forgiving nature

___18. Tends to be disorganized

___19. Worries a lot

___20. Has an active imagination

___21. Tends to be quiet

___22. Is generally trusting

___23. Tends to be lazy

___24. Is emotionally stable, not easily upset

___25. Is inventive

___26. Has an assertive personality

___27. Can be cold and aloof

___28. Perseveres until the task is finished

___29. Can be moody

___30. Values artistic, aesthetic experiences

___31. Is sometimes shy, inhibited

___32. Is considerate and kind to almost everyone

___33. Does things efficiently

___34. Remains calm in tense situations

___35. Prefers work that is routine

___36. Is outgoing, sociable

___37. Is sometimes rude to others

___38. Makes plans and follows through with them

___39. Gets nervous easily

___40. Likes to reflect, play with ideas

___41. Has few artistic interests

___42. Likes to cooperate with others

___43. Is easily distracted

___44. Is sophisticated in art, music, or literature

Please check: Did you write a number in front of each statement?

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You will shortly roll a die to determine whether you can choose to exchange the item you own.

Please indicate whether you would like to keep the item you own or exchange it for the other item by writing “keep” or “exchange” below.

<u>Remember that at the end of the session you will actually take home with you one of the items; fill in your choice below according to the item you prefer</u>.

My choice:____________.

Please raise your hand and wait for the monitor to instruct you to continue.

6

Before rolling the die, please carefully read and think about each of the following statements. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. **<u>Notice that the scale now goes from 1 to 7.</u>**

Disagree strongly	Disagree	Disagree a little	Neither agree nor disagree	Agree a little	Agree	Agree strongly
1	**2**	**3**	**4**	**5**	**6**	**7**

____ a. I like the bottle better than the chocolate.

____ b. During the session, I have spent some time thinking about what I would do with the bottle.

____ c. During the session, I have spent some time thinking about what I would do with the chocolate.

____ d. During the session, I have spent more time thinking about the bottle than about the chocolate.

____ e. During the session, I expected the bottle to be the item I take home.

____ f. During the session, I expected the chocolate to be the item I take home.

____ g. During the session, I expected the bottle more than the chocolate to be the item I take home.

____ h. During the session, I felt that I owned the bottle. I felt that it was already mine.

____ i. During the session, I felt that I owned the chocolate. I felt that it was already mine.

____ j. During the session, I felt that I owned the bottle more than I felt that I owned the chocolate.

If you have any comments or thoughts you would like to share with us, please write them on the lines below. <u>We are especially curious to know: how did you decide which item to choose?</u>

____

____

____

____

____

____

After you finish reading this paragraph, raise your hand to let the monitor know that you are ready. The monitor will ask to roll the die and write down the outcome and, accordingly, which item you will take with you at the end of the study. Then please wait until the other participants finish filling out their forms. Please do not touch the chocolate and bottle during this time. After everyone has finished, the monitors will arrange the payments and ask you to sign that you received your payment and gift. Thank you for participating in the study.

Die-roll outcome:____. Item participate will take home:_____________.

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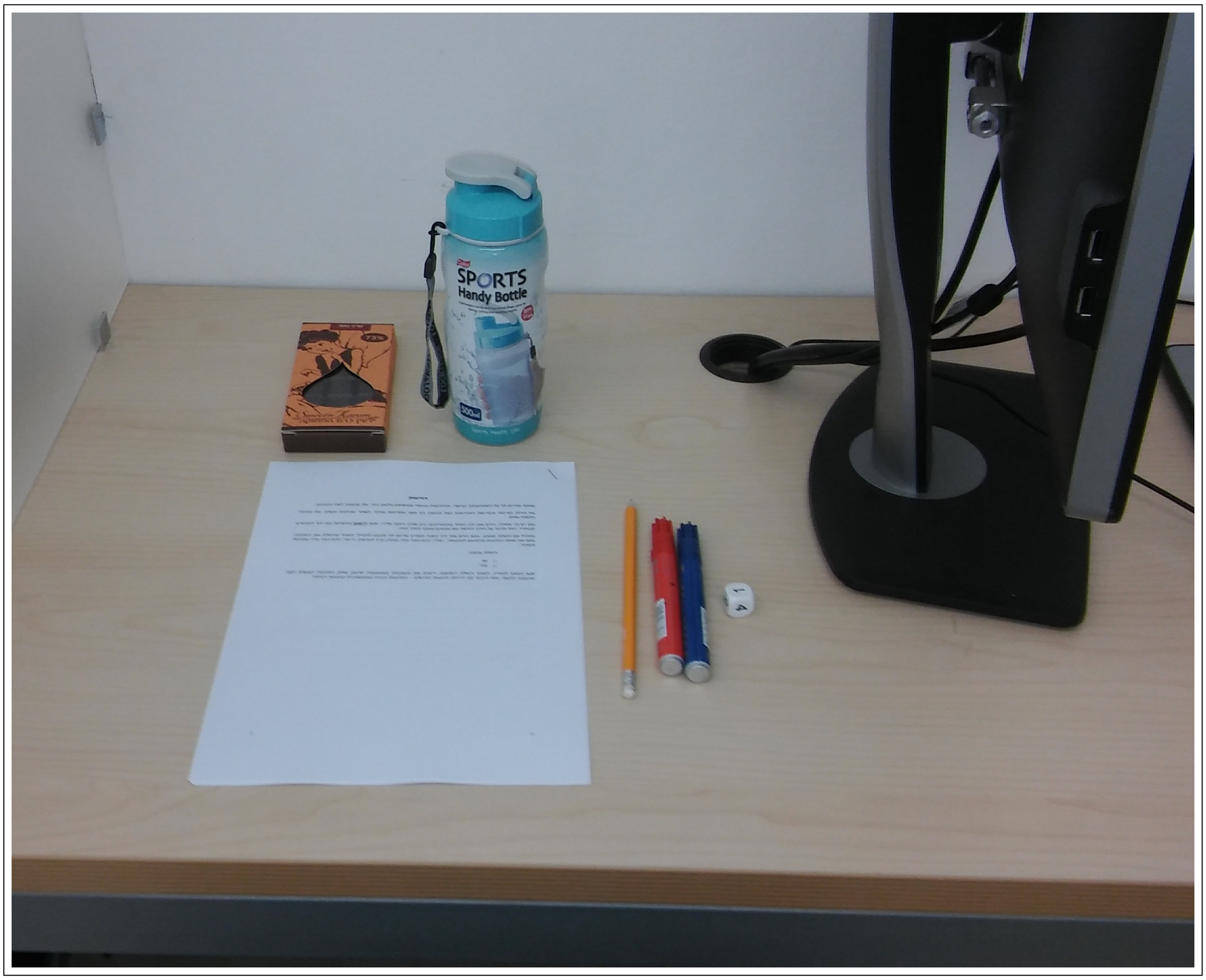
Appendix B: Study 2 Instruments Example



[Instructions start on the next page.]

Instructions

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We will start by flipping a coin. Please raise your hand and wait for the monitor to come and give you a coin to flip. After flipping it, check one box below, according to the coin-flip outcome. “Heads” is the side with the picture; “tails” is the side with the coin value.

Coin flip:

- ☐ Heads
- ☐ Tails

Please wait for the monitor. After the coin flip, please record your answer by checking one box above before continuing with the instructions. Try to remember the flip’s result – it will be important.

1

In front of you are two items — a chocolate bar and a water bottle. Your coin-flip has determined which one of them belongs to you as a gift to take home. Whether or not you can choose to exchange your item for the other item is determined at random, as explained below in detail.

In brief, you own the bottle if you flipped "heads" and the chocolate if you flipped "tails." The item you own is yours to keep. You own it for real, not just for the purpose of the study.

There is a onefive-in-six probability (that is $\frac{1}{6}\frac{5}{6}$, or about 17%83%) that you <u>will be able</u> to exchange it for the other item if you want to. However, there is a fiveone-in-six probability (that is $\frac{5}{6}\frac{1}{6}$, or about 83%17%) that you <u>will NOT be able</u> to exchange it.

Remember that everything written in these instructions is real: you will actually leave the room at the end of the session with one of the two items. Feel free to inspect the items but please return them both to their places before we continue.

Please inspect the items but set them back before continuing with the instructions.

In the end of the study, before you leave with one of the items, a die roll will determine if you can exchange the item you own for the other item. That part of the study will be carried out as follows:

1) We will ask you to choose whether you want to keep the item you own, or to exchange it for the other item.
2) We will ask you to roll a six-sided die.

If the outcome of the die isis not 4, you will take home the item determined by your choice in (1). That is, if you have just chosen to keep the item you own, you will take it home; and if you have just chosen to exchange it, you will take home the other item.

If the outcome of the die is notis 4, you will take home the item you own.

Remember that which item you own was determined by the coin-flip: you own the bottle if you flipped "heads" and the chocolate if you flipped "tails."

Notice that you have a onefive-in-six (or about 17%83%) chance to be able to exchange your item. In other words, there is a pretty high probability that you will take home the item you own regardless of your choice.your choice will determine which item you take home, regardless of the outcome of the coin flip. If you have any questions, please raise your hand.

You will now answer two comprehension questions to make sure that you understand exactly how the item you take home at the end of the study will be determined. Please turn to the next page to answer these questions.

Please answer the following two questions.

1. With a one-in-six chance, the outcome of the die will be 4. In that case:

   (Please check one box. If you check the bottom box, please also fill out the blank space: bottle or chocolate.)

☐ I will take home the item I choose, regardless of the coin-flip at the beginning of this study.
☐ I will take home the _________, as determined by the coin-flip at the beginning of this study, regardless of my choice.

2. With a five-in-six chance, the outcome of the die will not be 4. In that case:

   (Please check one box. If you check the bottom box, please also fill out the blank space: bottle or chocolate.)

☐ I will take home the item I choose, regardless of the coin-flip at the beginning of this study.
☐ I will take home the _________, as determined by the coin-flip at the beginning of this study, regardless of my choice.

Please raise your hand when you finish.

<u>Please do not proceed until the monitor has verified your answers to the questions above.</u>

Once the monitor asks you to proceed, please proceed to the next page, where the randomness of the die will be demonstrated. Following that, you will answer two sets of questions, and then you will proceed to choose whether you want to keep the item you own, or exchange it for the other item.

3

In this part of the study you will be asked to roll the die a few times, to demonstrate the randomness of a die roll.

In front of you are a six-sided die and two markers — one red and one blue.

The die is a fair die: the probability that it will land on any one of its sides is one in six ($\frac{1}{6}$).

Please roll the die. If the result is 4an even number, please color in blue the leftmost square below. If the result is not 4an odd number, please color in red the leftmost square below.

Now repeat this process 17 more times (overall 18 die rolls). After each roll, please color the leftmost empty square in the appropriate color. After 18 rolls, all squares should be colored.

How many squares did you color in red? ________.

How many squares did you color in blue?________.

Please answer the following questions. Notice that they probe your subjective feelings regarding probabilities, using verbal expressions.

Next to each question, write down a letter that expresses your feeling regarding the chance that the relevant event will take place, according to this table:

No chance at all	Nearly no chance	Very low chance	Low chance	Slightly low chance	Neither high nor low chance	Slightly high chance	High chance	Very high chance	Nearly certain	Completely certain
A	B	C	D	E	F	G	H	I	J	K

What is the chance that the outcome of the die will be 4? ____. (Write a letter from A to K)

What is the chance that the outcome of the die will not be 4? ____. (Write a letter from A to K)

Remember, later in the study you will be asked to choose "**Keep**" or "**Exchange**," and subsequently you will roll the die. If the outcome is 4not 4, your choice to keep or exchange will determine which item you will take with you at the end of the study. If the outcome is not 44, you will take home the item you own, regardless of your choice.

Prior to rolling the die, when I am asked to write "**keep**" or "**exchange**":

If I choose "**Keep**," what is the chance that I will take home the bottle?____. (Write a letter from A to K)

If I choose "**Keep**," what is the chance that I will take home the chocolate?____. (Write a letter from A to K)

If I choose "**Exchange**," what is the chance that I will take home the bottle?____. (Write a letter from A to K)

If I choose "**Exchange**," what is the chance that I will take home the chocolate?____. (Write a letter from A to K)

4

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. **Notice that the scale now goes from 1 to 5.**

Disagree strongly 1	Disagree a little 2	Neither agree nor disagree 3	Agree a little 4	Agree strongly 5

I see Myself as Someone Who…

___1. Is talkative

___2. Tends to find fault with others

___3. Does a thorough job

___4. Is depressed, blue

___5. Is original, comes up with new ideas

___6. Is reserved

___7. Is helpful and unselfish with others

___8. Can be somewhat careless

___9. Is relaxed, handles stress well

___10. Is curious about many different things

___11. Is full of energy

___12. Starts quarrels with others

___13. Is a reliable worker

___14. Can be tense

___15. Is ingenious, a deep thinker

___16. Generates a lot of enthusiasm

___17. Has a forgiving nature

___18. Tends to be disorganized

___19. Worries a lot

___20. Has an active imagination

___21. Tends to be quiet

___22. Is generally trusting

___23. Tends to be lazy

___24. Is emotionally stable, not easily upset

___25. Is inventive

___26. Has an assertive personality

___27. Can be cold and aloof

___28. Perseveres until the task is finished

___29. Can be moody

___30. Values artistic, aesthetic experiences

___31. Is sometimes shy, inhibited

___32. Is considerate and kind to almost everyone

___33. Does things efficiently

___34. Remains calm in tense situations

___35. Prefers work that is routine

___36. Is outgoing, sociable

___37. Is sometimes rude to others

___38. Makes plans and follows through with them

___39. Gets nervous easily

___40. Likes to reflect, play with ideas

___41. Has few artistic interests

___42. Likes to cooperate with others

___43. Is easily distracted

___44. Is sophisticated in art, music, or literature

Please check: Did you write a number in front of each statement?

You will shortly roll a die to determine whether your choice, which you will make on this page, will determine which item you will take home with you.

Please indicate whether you would like to keep the item you own or exchange it for the other item by writing “keep” or “exchange” below.

Remember that at the end of the session you will actually take home with you one of the items; fill in your choice below according to the item you prefer.

My choice:_____________.

Please raise your hand and wait for the monitor to instruct you to continue.

6

Before rolling the die (on the next page), please carefully read and think about each of the following statements. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. **Notice that the scale now goes from 1 to 7.**

Disagree strongly	Disagree	Disagree a little	Neither agree nor disagree	Agree a little	Agree	Agree strongly
1	**2**	**3**	**4**	**5**	**6**	**7**

____ a. I like the bottle better than the chocolate.

____ b. During the session, I have spent some time thinking about what I would do with the bottle.

____ c. During the session, I have spent some time thinking about what I would do with the chocolate.

____ d. During the session, I have spent more time thinking about the bottle than about the chocolate.

____ e. During the session, I expected the bottle to be the item I take home.

____ f. During the session, I expected the chocolate to be the item I take home.

____ g. During the session, I expected the bottle more than the chocolate to be the item I take home.

____ h. During the session, I felt that I owned the bottle. I felt that it was already mine.

____ i. During the session, I felt that I owned the chocolate. I felt that it was already mine.

____ j. During the session, I felt that I owned the bottle more than I felt that I owned the chocolate.

____ k. During the session, I wanted the bottle to be the item I take home more than I did the chocolate.

____ l. During the session, I felt that the bottle was harder to get than the chocolate.

____ m. During the session, I knew exactly which item I want to take home.

____ n. During the session, I thought it would be more interesting and suspenseful if chance/randomness determined which item I take home.

If you have any comments or thoughts you would like to share with us, please write them on the lines below. <u>We are especially curious to know: how did you decide which item to choose?</u>

____
____
____
____
____
____
____
____

7

Please indicate your sex: _________. (write male/female)

After you finish reading this paragraph, raise your hand to let the monitor know that you are ready. The monitor will ask to roll the die and write down the outcome and, accordingly, which item you will take with you at the end of the study. Then please wait until the other participants finish filling out their forms. Please do not touch the chocolate and bottle during this time. After everyone has finished, the monitors will arrange the payments and ask you to sign that you received your payment and gift. Thank you for participating in the study.

Die-roll outcome:____. Item participate will take home:_____________.

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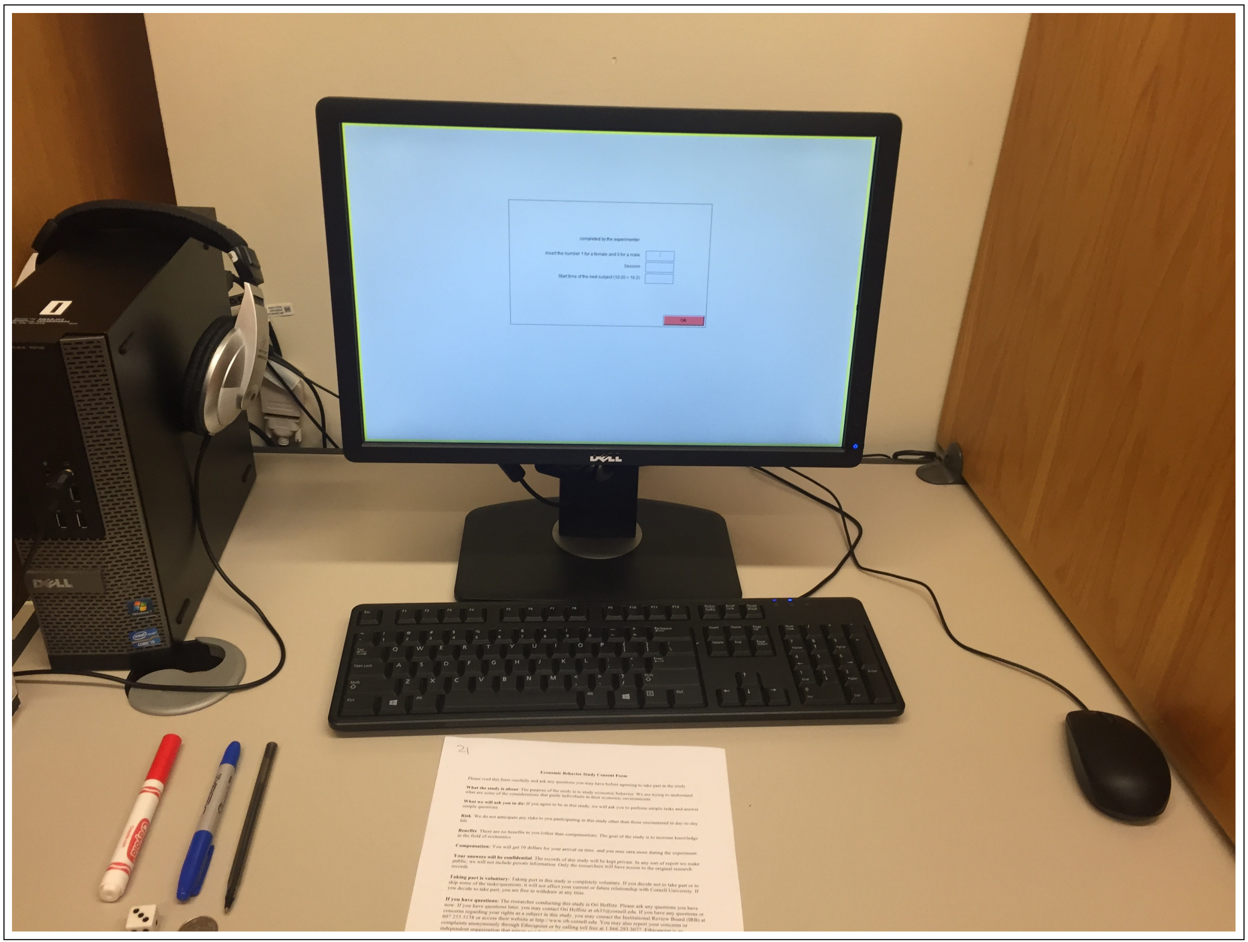
Appendix C: Study 3 Instruments Example



[Instructions start on the next page.]

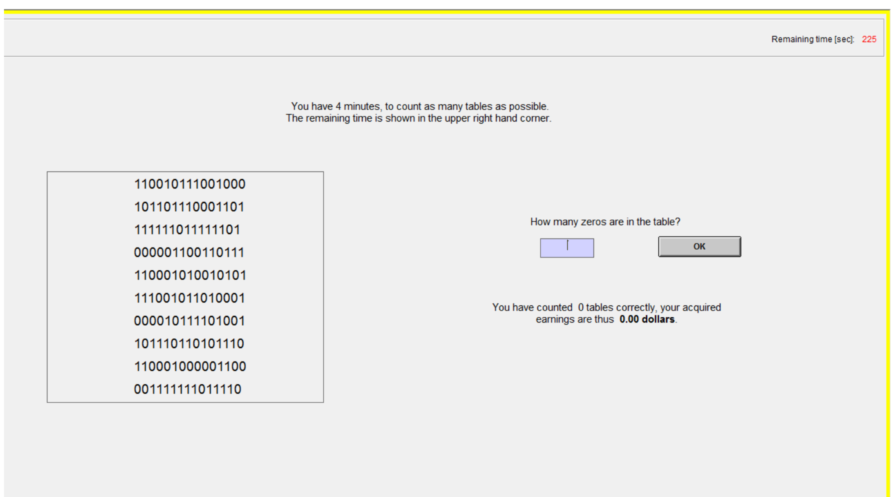
Instructions

The experiment consists of two parts. Please start by reading the explanations for the first part carefully. You will receive the instructions for the second part of the experiment after the first part is finished. For your arrival on time, you receive **10 dollars** that will be paid to you at the end of the experiment. If you have any questions during the experiment please ask the experimenter. If you use the computer in an improper way you will be excluded from the experiment and from any payment.

Instructions for the first part of the experiment

What do you have to do?

In this part of the experiment your task is to count zeros in a series of tables. The figure shows the work screen you will use later:



Enter the number of zeros into the box on the right side of the screen. After you have entered the number, click the OK-button. If you enter the correct result, a new table will be generated. If your input was wrong, you have two additional tries to enter the correct number into the table. You therefore have a total of three tries to solve each table. If you entered the correct number of zeros you earn money: **You receive 10 cents for each table you solved correctly.**

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If you enter three times a wrong number for a table, 10 cents will be subtracted from your earnings and a new table will then be generated. The earnings of this part of the experiment will be paid to you at the end of the experiment.

Example: You solve three tables correctly; you miscount one table once. You miscount a fourth table three times. Your earnings are therefore: 3×10c for the correctly counted tables - 1×10c for the fourth table, which you miscounted three times. Thus a total of 20c.

You have 4 minutes until the first part of the experiment is over. The remaining time is displayed in the upper right hand corner of the screen.

Counting tips: Of course you can count the zeros any way you want. Speaking from experience, however, it is helpful to always count two zeros at once and multiply the resulting number by two at the end. In addition you miscount less frequently if you track the number you are currently counting with the mouse cursor.

Example question

Please answer the following question: Assume you have solved 5 tables correctly, and miscounted two tables three times.

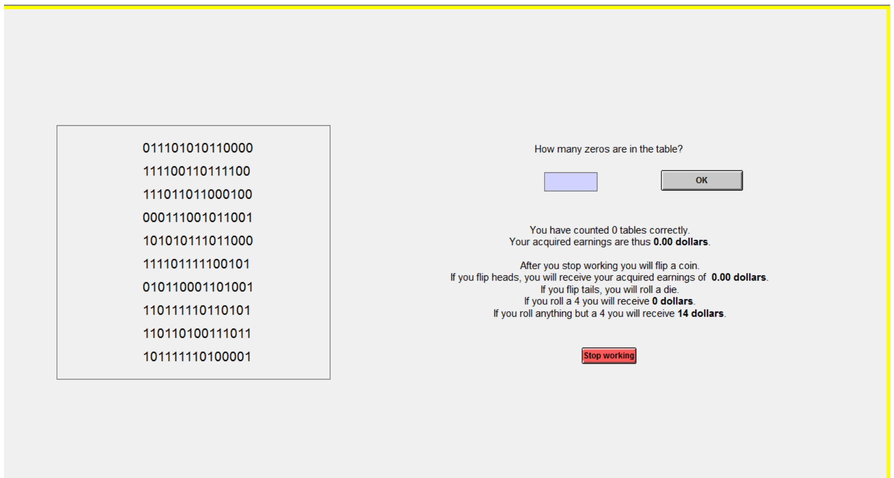
What are your acquired earnings? ________ dollars

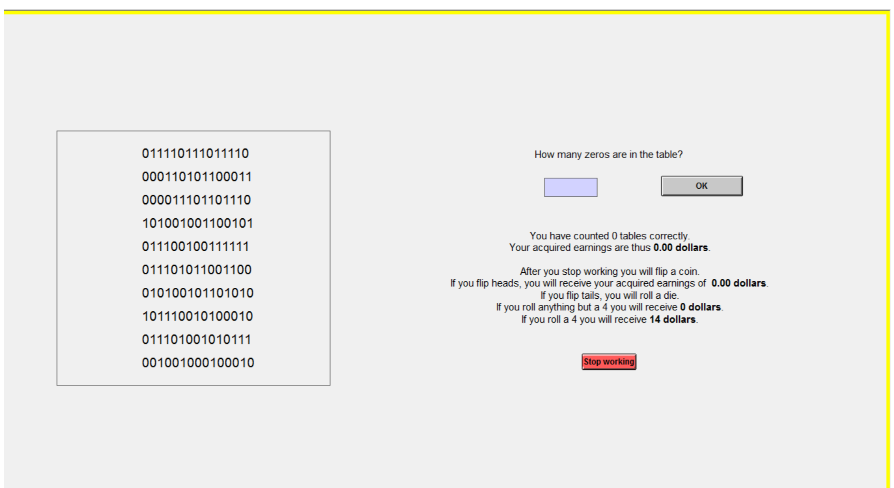
After you have answered the example question correctly, the experimenter will start the first part of the experiment.

Instructions for the second part of the experiment

What do you have to do?

The task in this part of the experiment is once again to count zeros in a series of tables. The figure shows the work screen you will use later:





New rules are now in effect, which did not apply in the first part:

- **For each correctly solved table you will be credited 20 cents.** After three wrong inputs 20 cents will be subtracted from your earnings.
- It is possible to lose the acquired earnings from this part of the experiment: There are a coin and a six-sided die in front of you. After you

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have finished your task, the experimenter will come to your room and ask you to flip the coin.

- **If you flip heads, you will get your acquired earnings; in this case the die will have no role.**
- **If you flip tails, the experimenter will ask you to roll the die.**
  - **If you rolldo not roll a 4, you will get 0 dollars and not your acquired earnings.** The amount of 0 dollars does not change, no matter how many tables you solved.
  - **If you do not rollroll a 4, you will get 14 dollars and not your acquired earnings.** The amount of 14 dollars does not change, no matter how many tables you solved.

Notice that there is a 1-in-2 chance (or 50%) that you will receive your acquired earnings, and a 1-in-2 chance (or 50%) that you will not. If you do not receive your acquired earnings, there is a 1-in-6 chance (or around 17%)5-in-6 chance (or around 83%) that you will receive 0 dollars, and a 5-in-6 chance (or around 83%)1-in-6 chance (or around 17%) that you will receive 14 dollars.

Important: In this part of the experiment you can count zeros as long as you want. This means you can decide yourself when you want to stop working. You can work, however, at most 60 minutes. If you want to stop counting, please click on the **red button** "stop working" and contact us by briefly stepping into the corridor. You will be paid in your room.

Example: You stop after 10 minutes and have solved 24 tables correctly with no miscounts. Your acquired earnings are therefore 24×20c = 4.80 dollars. You flip heads. You therefore get 4.80 dollars.

Example: You stop after 10 minutes and have solved 24 tables correctly with no miscounts. Your acquired earnings are therefore 24×20c = 4.80 dollars. You flip tails and roll a 4number other than 4. You therefore get 0 dollars instead of 4.80 dollars.

Example: You stop after 10 minutes and have solved 24 tables correctly with no miscounts. Your acquired earnings are therefore 24×20c = 4.80 dollars. You flip

4

heads and roll a number other than 44. You therefore get 14 dollars instead of 4.80 dollars.

Example: You stop after 30 minutes and have solved 4 tables correctly and miscounted three times at a fifth table. Your acquired earnings are therefore 4×20c - 1×20c = 60c. You flip tails and roll a 4number other than 4. You therefore get 0 dollars instead of your acquired earnings of 60c.

Example: You stop after 30 minutes and have solved 4 tables correctly and miscounted three times at a fifth table. Your acquired earnings are therefore 4×20c - 1×20c = 60c. You flip tails and roll a number other than 44. You therefore get 14 dollars instead of your acquired earnings of 60c.

Example questions

Please answer the following questions:

Assume you have solved 28 tables correctly within 20 minutes.

- What are your acquired earnings? _______dollars
- How much money will you get if the coin flip outcome is heads? _______dollars
- How much money will you get if the coin flip outcome is tails and the die roll outcome is 4? _______dollars
- How much money will you get if the coin flip outcome is tails and the die roll outcome is 2? _______dollars

Assume you have solved 7 tables correctly within 15 minutes.

- What are your acquired earnings? _______dollars
- How much money will you get if the coin flip outcome is heads? _______dollars
- How much money will you get if the coin flip outcome is tails and the die roll outcome is 4? _______dollars
- How much money will you get if the coin flip outcome is tails and the die roll outcome is 2? _______dollars

Please call the experimenter. Do not proceed until the experimenter has verified your answers to the example questions.

You are almost ready to start the table-solving task on the screen. Before you do, we would like to demonstrate to you the randomness of a die roll.

In front of you are a six-sided die and two markers — one red and one blue.
The die is a fair die: the probability that it will land on any one of its sides is one in six ($\frac{1}{6}$).
Please roll the die. If the result is 4an even number, please color in blue the leftmost square below. If the result is not 4an odd number, please color in red the leftmost square below.

Now repeat this process 17 more times (overall 18 die rolls). After each roll, please color the leftmost empty square in the appropriate color. After 18 rolls, all squares should be colored.

- How many squares did you color in red? ________.
- How many squares did you color in blue? ________.

Please answer the following questions. Notice that they probe your subjective feelings regarding probabilities, using verbal expressions.

Next to each question, write down a letter that expresses your feeling regarding the chance that the relevant event will take place, according to this table:

No chance at all	**Nearly no chance**	**Very low chance**	**Low chance**	**Slightly low chance**	**Neither high nor low chance**	**Slightly high chance**	**High chance**	**Very high chance**	**Nearly certain**	**Completely certain**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**

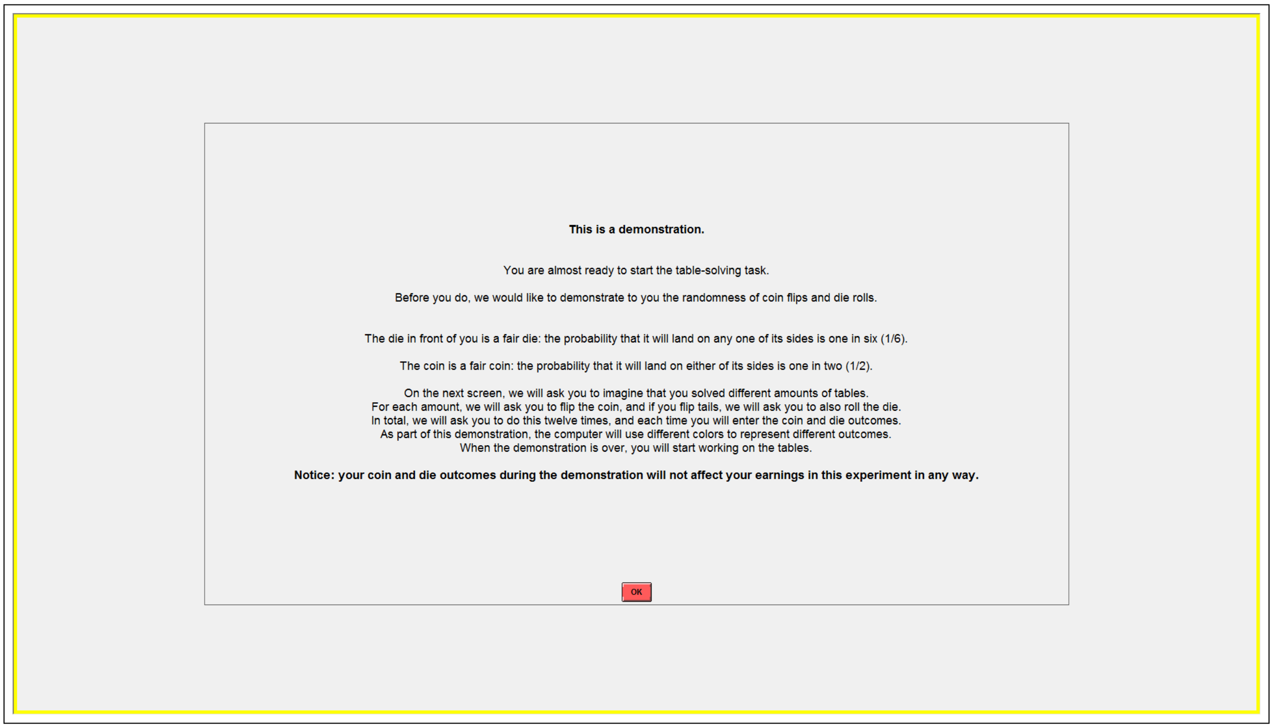
- What is the chance of rolling a 4? ____. (Write a letter from A to K)
- What is the chance of not rolling a 4? ____. (Write a letter from A to K)

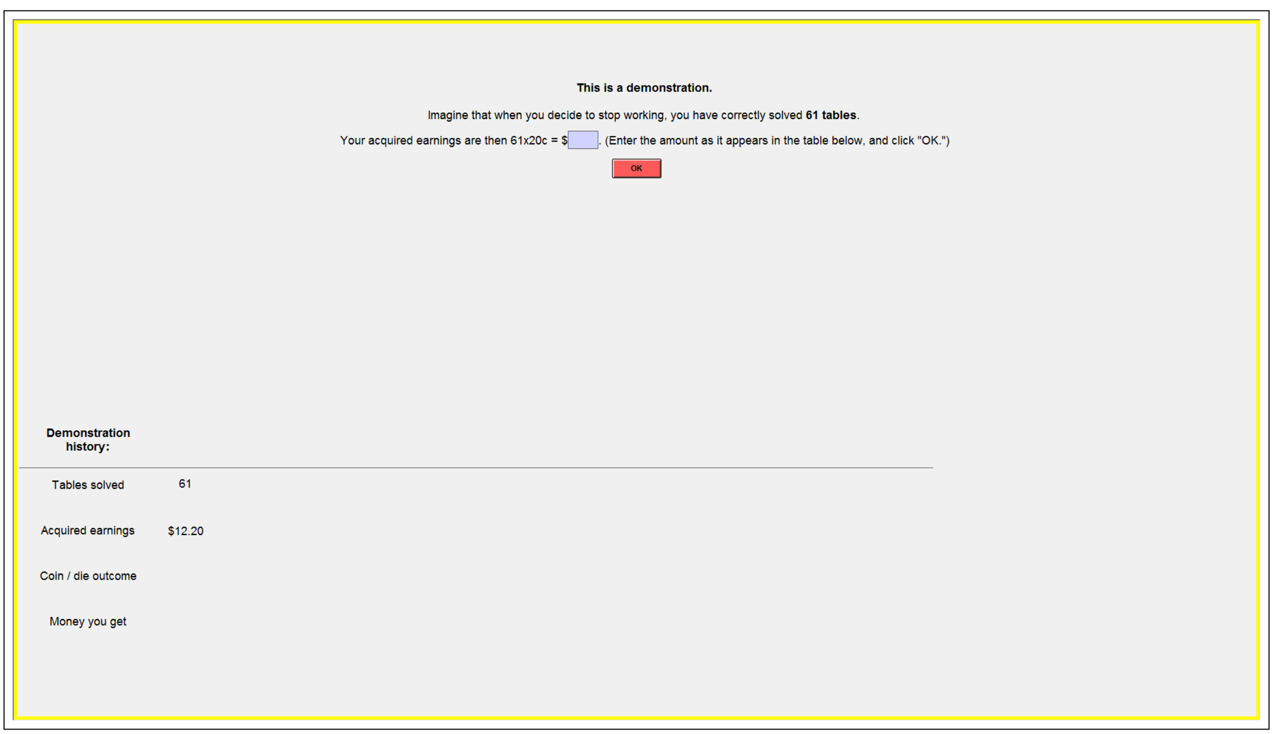
Remember, after you decide to stop solving tables, you will flip a coin. If you flip heads, you will receive your acquired earnings; if you flip tails, you will roll a die. If you roll a 4do not roll a 4 you will receive 0 dollars; if you do not roll a 4roll a 4 you will receive 14 dollars.

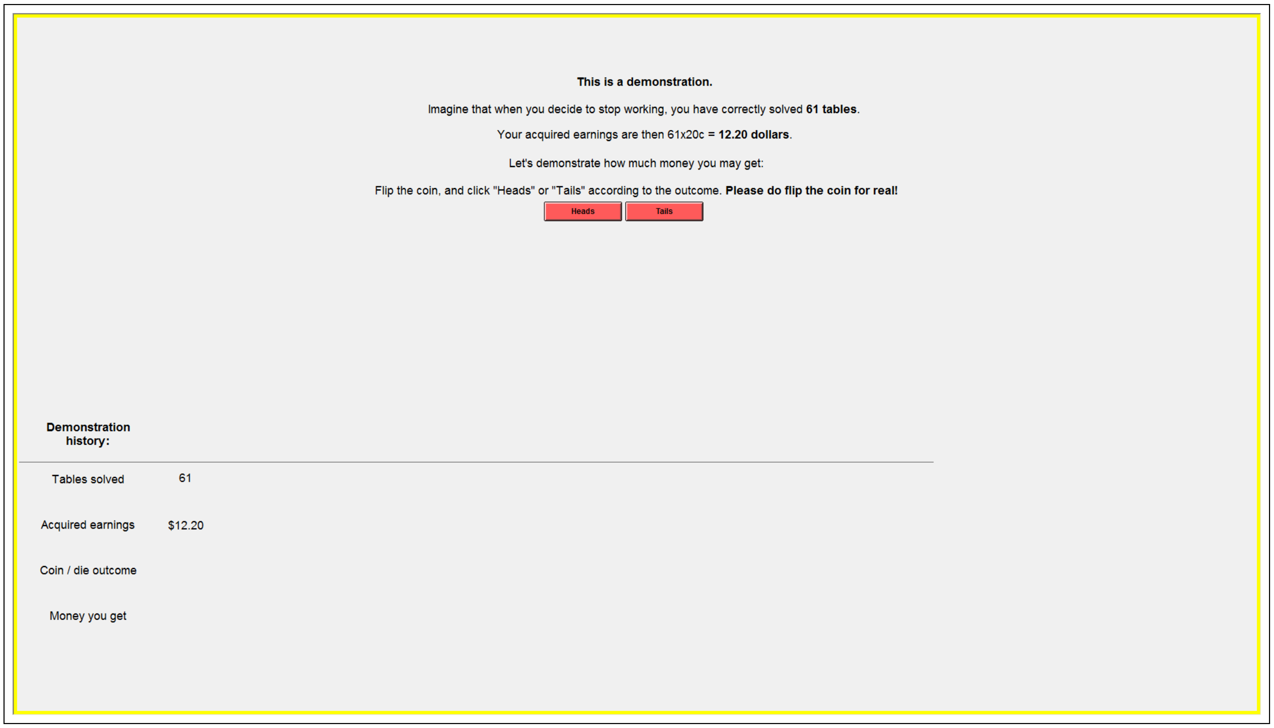
- What is the chance that you will receive your acquired earnings? ______. (Write a letter from A to K)
- What is the chance that you will not receive your acquired earnings, and receive 0 dollars instead? ____. (Write a letter from A to K)
- What is the chance that you will not receive your acquired earnings, and receive 14 dollars instead? ____. (Write a letter from A to K)

After you have answered these questions, please ask the experimenter to start the second part of the experiment.

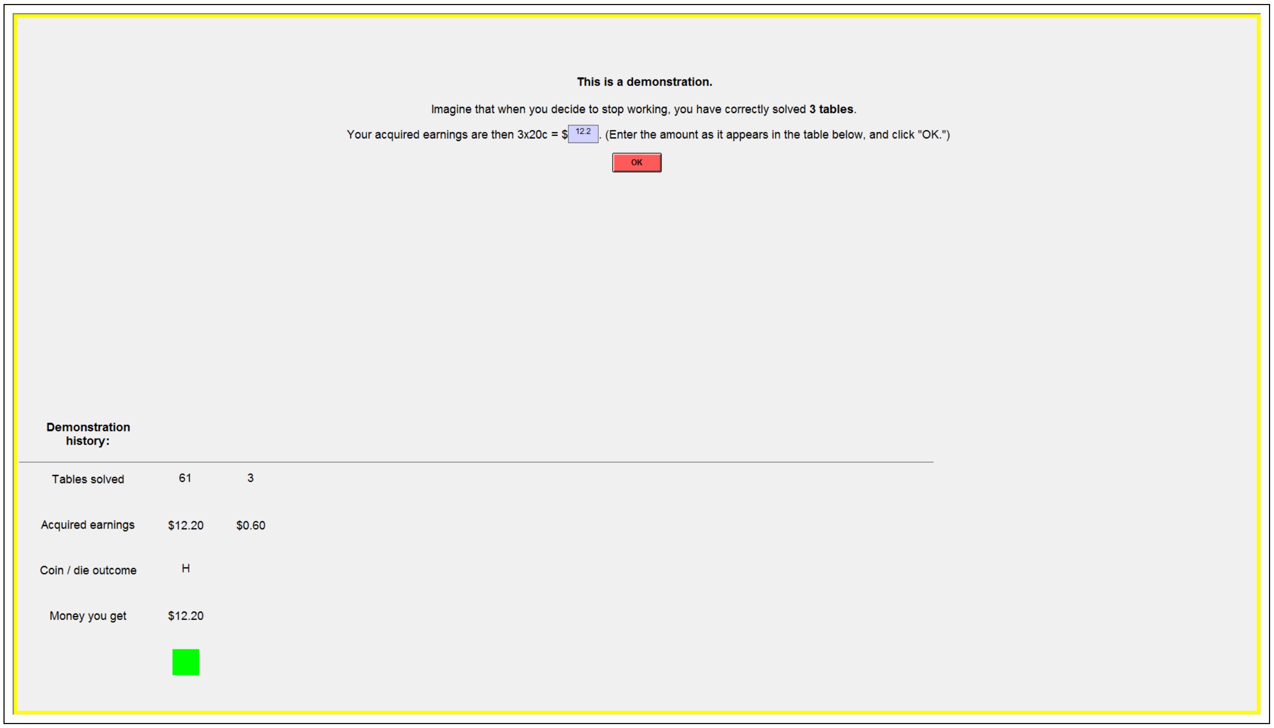
Appendix D: Study 4 Screenshots and Description

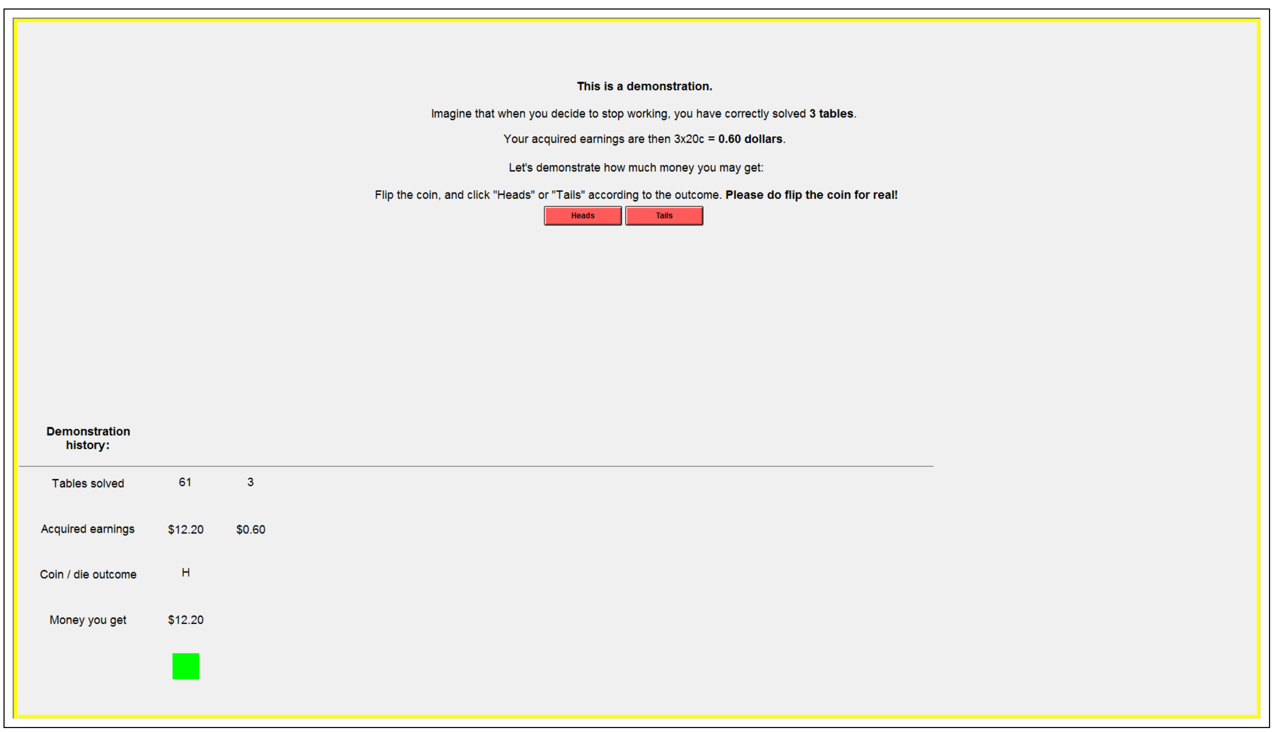


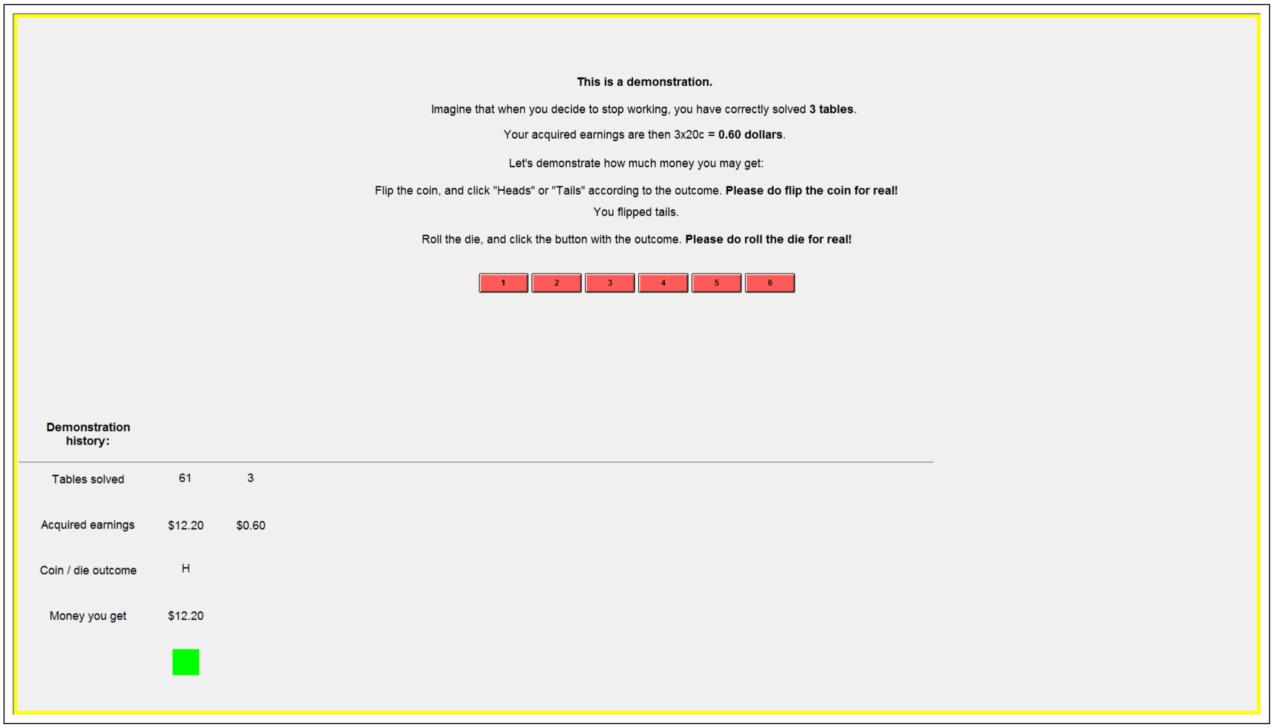


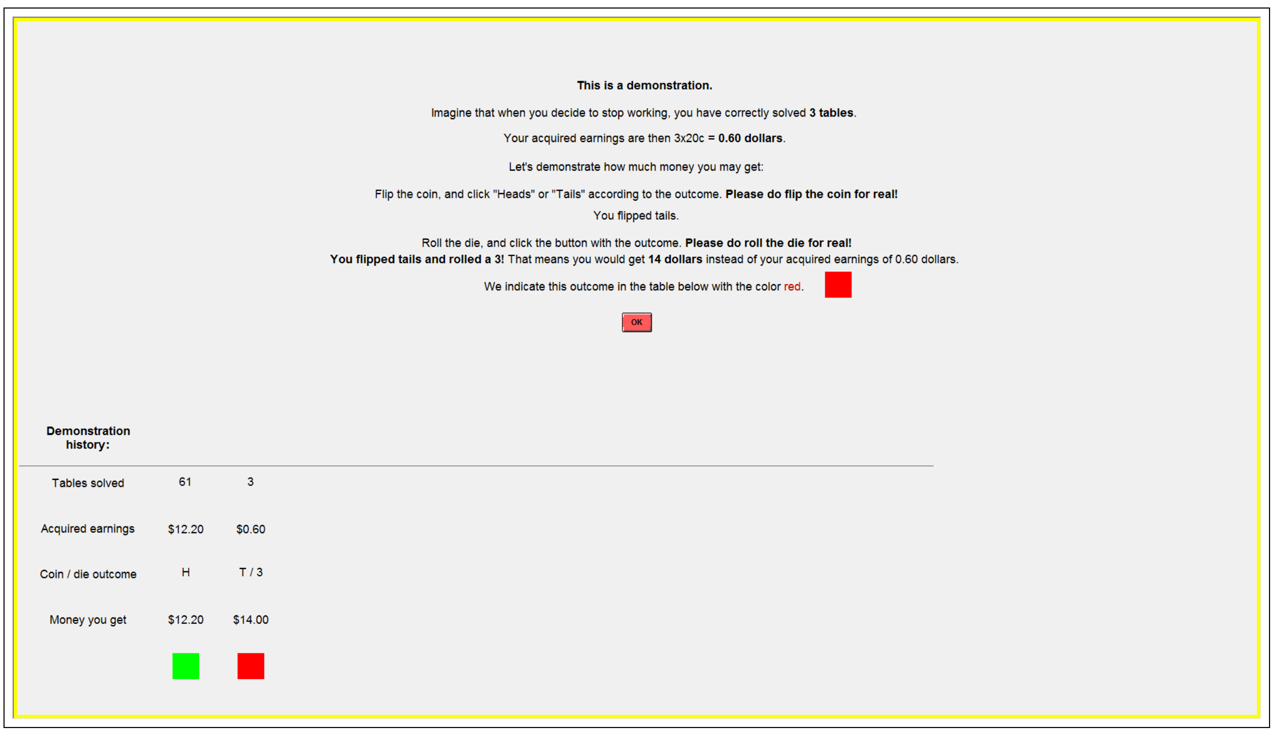

This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 61 tables.
Your acquired earnings are then 61x20c = 12.20 dollars.
Let's demonstrate how much money you may get:
Flip the coin, and click "Heads" or "Tails" according to the outcome. Please do flip the coin for real!
Heads
Tails
Demonstration history:
Tables solved
61
Acquired earnings
$12.20
Coin / die outcome
Money you get


This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 61 tables.
Your acquired earnings are then 61x20c = 12.20 dollars.
Let's demonstrate how much money you may get:
Flip the coin, and click "Heads" or "Tails" according to the outcome. Please do flip the coin for real!
You flipped heads! That means you would get your acquired earnings of 12.20 dollars.
We indicate this outcome in the table below with the color green.
OK
Demonstration history:
Tables solved
61
Acquired earnings
$12.20
Coin / die outcome
H
Money you get
$12.20


This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 3 tables.
Your acquired earnings are then 3x20c = $ 12.2 . (Enter the amount as it appears in the table below, and click "OK.")
OK
Demonstration history:
Tables solved 61 3
Acquired earnings $12.20 $0.60
Coin / die outcome H
Money you get $12.20


This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 3 tables.
Your acquired earnings are then 3x20c = 0.60 dollars.
Let's demonstrate how much money you may get:
Flip the coin, and click "Heads" or "Tails" according to the outcome. Please do flip the coin for real!
Heads
Tails
Demonstration history:
Tables solved 61 3
Acquired earnings $12.20 $0.60
Coin / die outcome H
Money you get $12.20


This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 3 tables.
Your acquired earnings are then 3x20c = 0.60 dollars.
Let's demonstrate how much money you may get:
Flip the coin, and click "Heads" or "Tails" according to the outcome. Please do flip the coin for real!
You flipped tails.
Roll the die, and click the button with the outcome. Please do roll the die for real!
1 2 3 4 5 6
Demonstration history:
Tables solved 61 3
Acquired earnings $12.20 $0.60
Coin / die outcome H
Money you get $12.20


This is a demonstration.
Imagine that when you decide to stop working, you have correctly solved 3 tables.
Your acquired earnings are then 3x20c = 0.60 dollars.
Let's demonstrate how much money you may get:
Flip the coin, and click "Heads" or "Tails" according to the outcome. Please do flip the coin for real!
You flipped tails.
Roll the die, and click the button with the outcome. Please do roll the die for real!
You flipped tails and rolled a 3! That means you would get 14 dollars instead of your acquired earnings of 0.60 dollars.
We indicate this outcome in the table below with the color red.
OK
Demonstration history:
Tables solved 61 3
Acquired earnings $12.20 $0.60
Coin / die outcome H T / 3
Money you get $12.20 $14.00

This is a demonstration.

Imagine that when you decide to stop working, you have correctly solved **50 tables**.

Your acquired earnings are then 50x20c = **10.00 dollars**.

Let's demonstrate how much money you may get:

Flip the coin, and click "Heads" or "Tails" according to the outcome. **Please do flip the coin for real!**

You flipped tails.

Roll the die, and click the button with the outcome. **Please do roll the die for real!**
You flipped tails and rolled a 4! That means you would get **0 dollars** instead of your acquired earnings of 10.00 dollars.

We indicate this outcome in the table below with the color blue.

OK

Demonstration history:

Tables solved	61	3	50
Acquired earnings	$12.20	$0.60	$10.00
Coin / die outcome	H	T / 3	T / 4
Money you get	$12.20	$14.00	$0.00

This is a demonstration.

Imagine that when you decide to stop working, you have correctly solved **77 tables**.

Your acquired earnings are then 77x20c = **15.40 dollars**.

Let's demonstrate how much money you may get:

Flip the coin, and click "Heads" or "Tails" according to the outcome. **Please do flip the coin for real!**

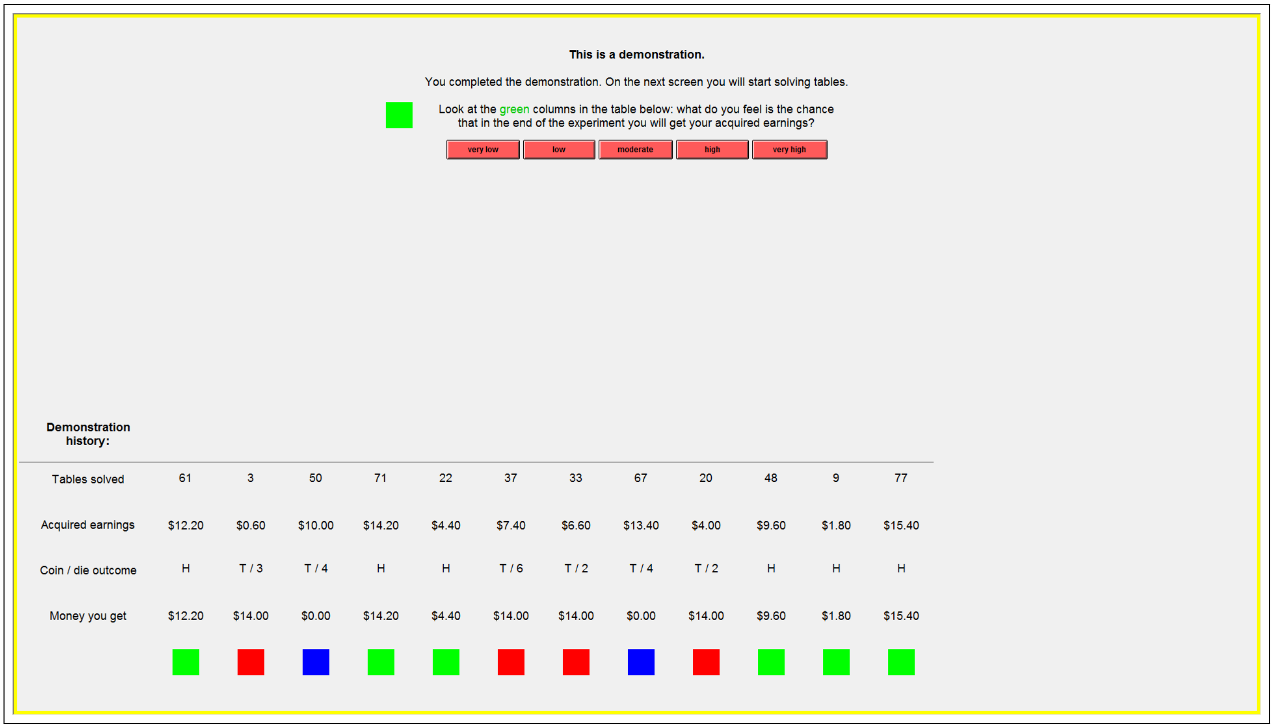
You flipped heads! That means you would get your acquired earnings of **15.40 dollars**.

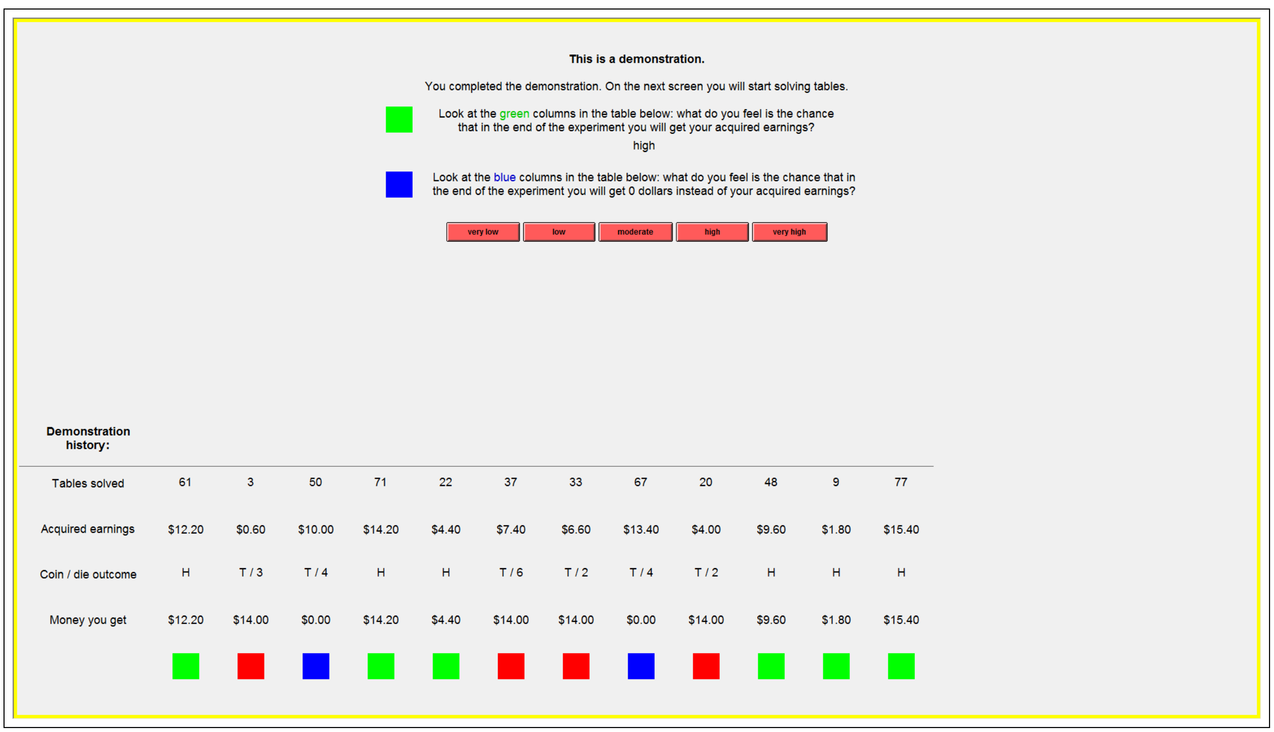
We indicate this outcome in the table below with the color green.

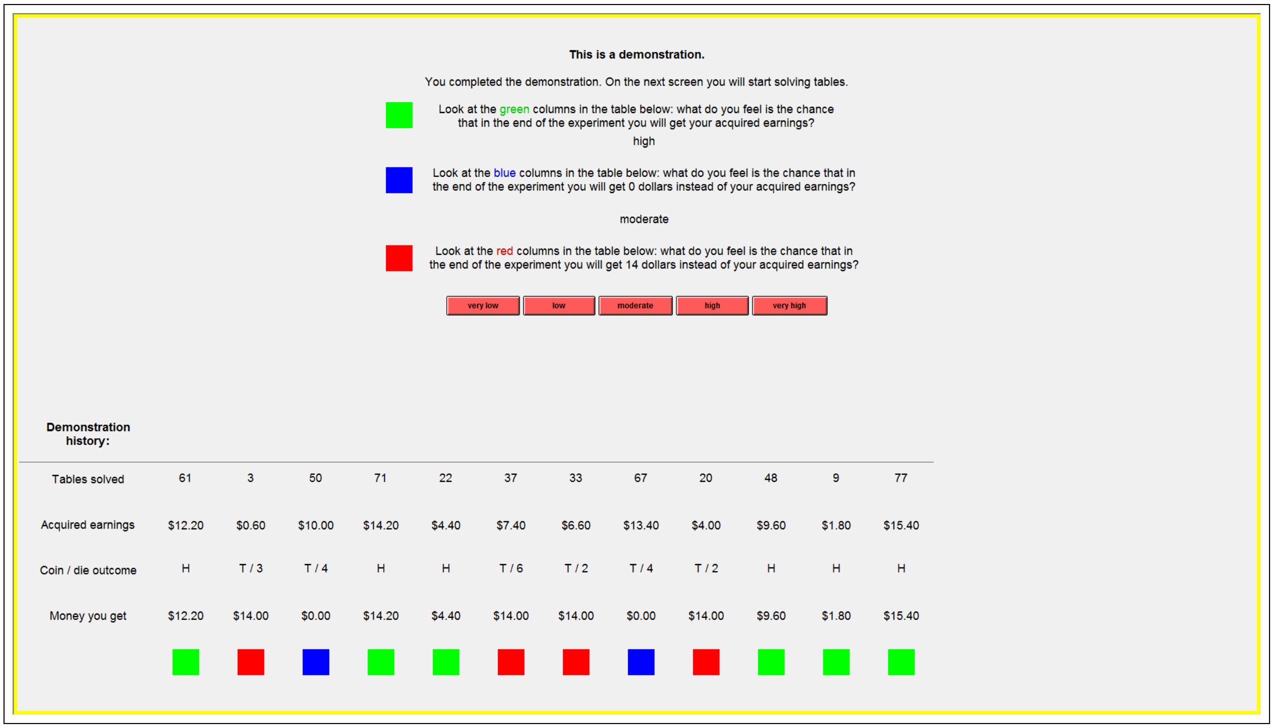
OK

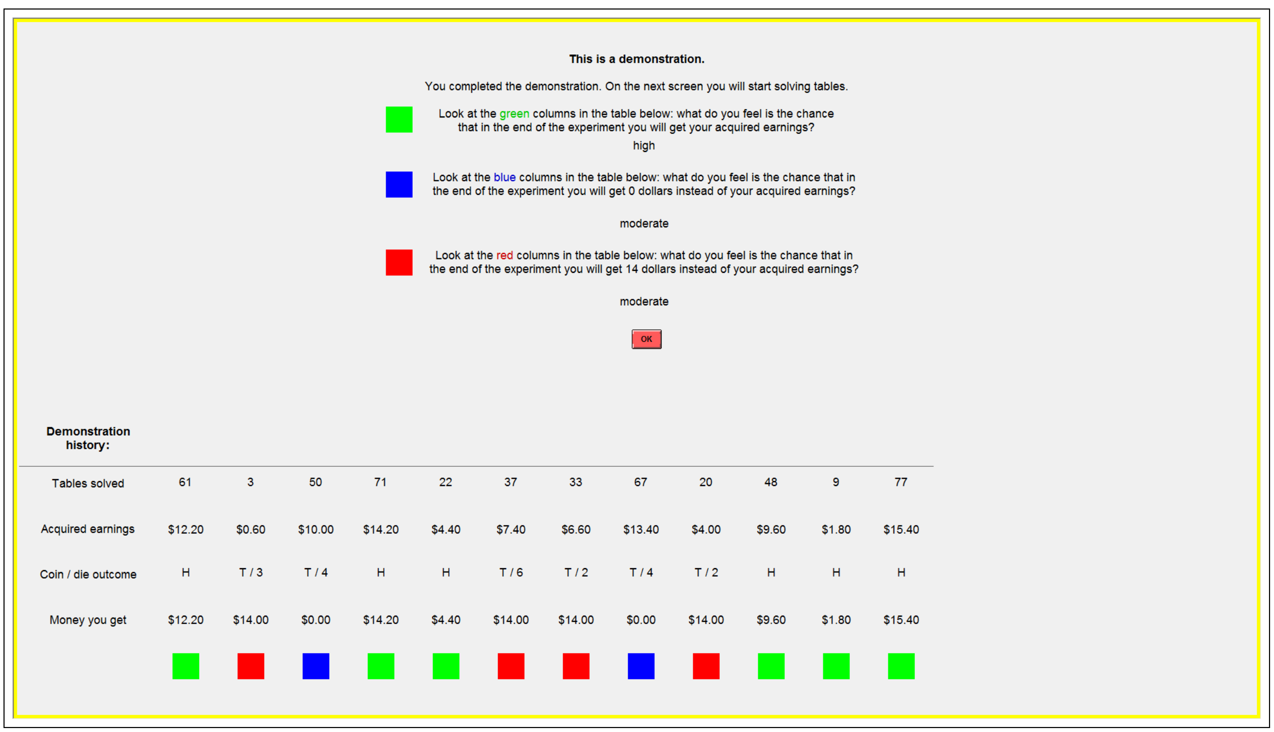
Demonstration history:

Tables solved	61	3	50	71	22	37	33	67	20	48	9	77
Acquired earnings	$12.20	$0.60	$10.00	$14.20	$4.40	$7.40	$6.60	$13.40	$4.00	$9.60	$1.80	$15.40
Coin / die outcome	H	T / 3	T / 4	H	H	T / 6	T / 2	T / 4	T / 2	H	H	H
Money you get	$12.20	$14.00	$0.00	$14.20	$4.40	$14.00	$14.00	$0.00	$14.00	$9.60	$1.80	$15.40


This is a demonstration.
You completed the demonstration. On the next screen you will start solving tables.
Look at the green columns in the table below: what do you feel is the chance that in the end of the experiment you will get your acquired earnings?
very low
low
moderate
high
very high
Demonstration history:
Tables solved 61 3 50 71 22 37 33 67 20 48 9 77
Acquired earnings $12.20 $0.60 $10.00 $14.20 $4.40 $7.40 $6.60 $13.40 $4.00 $9.60 $1.80 $15.40
Coin / die outcome H T / 3 T / 4 H H T / 6 T / 2 T / 4 T / 2 H H H
Money you get $12.20 $14.00 $0.00 $14.20 $4.40 $14.00 $14.00 $0.00 $14.00 $9.60 $1.80 $15.40


This is a demonstration.
You completed the demonstration. On the next screen you will start solving tables.
Look at the green columns in the table below: what do you feel is the chance that in the end of the experiment you will get your acquired earnings?
high
Look at the blue columns in the table below: what do you feel is the chance that in the end of the experiment you will get 0 dollars instead of your acquired earnings?
very low
low
moderate
high
very high
Demonstration history:
Tables solved 61 3 50 71 22 37 33 67 20 48 9 77
Acquired earnings $12.20 $0.60 $10.00 $14.20 $4.40 $7.40 $6.60 $13.40 $4.00 $9.60 $1.80 $15.40
Coin / die outcome H T / 3 T / 4 H H T / 6 T / 2 T / 4 T / 2 H H H
Money you get $12.20 $14.00 $0.00 $14.20 $4.40 $14.00 $14.00 $0.00 $14.00 $9.60 $1.80 $15.40


This is a demonstration.
You completed the demonstration. On the next screen you will start solving tables.
Look at the green columns in the table below: what do you feel is the chance that in the end of the experiment you will get your acquired earnings?
high
Look at the blue columns in the table below: what do you feel is the chance that in the end of the experiment you will get 0 dollars instead of your acquired earnings?
moderate
Look at the red columns in the table below: what do you feel is the chance that in the end of the experiment you will get 14 dollars instead of your acquired earnings?
very low
low
moderate
high
very high
Demonstration history:
Tables solved 61 3 50 71 22 37 33 67 20 48 9 77
Acquired earnings $12.20 $0.60 $10.00 $14.20 $4.40 $7.40 $6.60 $13.40 $4.00 $9.60 $1.80 $15.40
Coin / die outcome H T / 3 T / 4 H H T / 6 T / 2 T / 4 T / 2 H H H
Money you get $12.20 $14.00 $0.00 $14.20 $4.40 $14.00 $14.00 $0.00 $14.00 $9.60 $1.80 $15.40


This is a demonstration.
You completed the demonstration. On the next screen you will start solving tables.
Look at the green columns in the table below: what do you feel is the chance that in the end of the experiment you will get your acquired earnings?
high
Look at the blue columns in the table below: what do you feel is the chance that in the end of the experiment you will get 0 dollars instead of your acquired earnings?
moderate
Look at the red columns in the table below: what do you feel is the chance that in the end of the experiment you will get 14 dollars instead of your acquired earnings?
moderate
OK
Demonstration history:
Tables solved 61 3 50 71 22 37 33 67 20 48 9 77
Acquired earnings $12.20 $0.60 $10.00 $14.20 $4.40 $7.40 $6.60 $13.40 $4.00 $9.60 $1.80 $15.40
Coin / die outcome H T / 3 T / 4 H H T / 6 T / 2 T / 4 T / 2 H H H
Money you get $12.20 $14.00 $0.00 $14.20 $4.40 $14.00 $14.00 $0.00 $14.00 $9.60 $1.80 $15.40

Following the demonstration's introductory screen (reproduced as the first screen above, and described in the main text), when subjects click "OK" and start the demonstration, they are instructed on the next screen:

> Imagine that when you decide to stop working, you have correctly solved **61 tables**. Your acquired earnings are then 61×20c = ___. (Enter the amount as it appears in the table below, and click "OK.")

The number 61, and eleven additional numbers (the same for all subjects), were randomly chosen prior to the experiment.[1] At the bottom of the screen, the first column of a four-row "**Demonstration history**" table shows "61" in a "Tables solved" row and "$12.20" in an "Acquired earnings" row beneath it. The next two rows, "Coin / die outcome" and "Money you get," are still empty.[2] Subjects are then asked to flip a coin ("**for real!**") and click "Heads" or "Tails" according to the outcome. Subjects who flip heads are told that they would in that case get their acquired earnings; the demonstration-history table's first column shows "H" and "$12.20," respectively, in its bottom two rows, and—as is explained to subjects—a salient green label appears below the column, to visibly mark it as an "acquired earnings" column. Subjects who flip tails are asked to roll a die ("**for real!**") and report the outcome by clicking one of six buttons. Those who (do not) roll a 4 are told that they would get ($0/$14) $14/$0 instead of their acquired earnings, according to experimental treatment; the relevant table rows then show these outcomes (e.g., "T / 3" and "$14.00" or "T / 4" and "$0.00"), and a colored label—(red) blue for those who (do not) roll a 4—marks the column. Subjects repeat this process eleven more times.

Once the demonstration-history table is full, with each of twelve columns documenting a different imagined scenario and outcome (marked by a distinctively different color), subjects are asked to look at the green columns and to express their feelings regarding the chance that in the end of the experiment they will get their acquired earning. They click one of five buttons, ranging from "very low" to "very high."[3] Subjects then answer two similar questions regarding the blue (red) columns and the chance of getting $14/$0 ($0/$14) instead

[1] We used `www.random.org` to randomly select 12 integers $T_i, i = 1, \ldots, 12$, each in the range $[0, 6]$, and we added to each $7(i-1)$ to create 12 integers that are somewhat "smoothly" spread over the range $[0, 83]$. To avoid monotonicity, we used a random permutation of the 12 resulting integers (the same for all subjects).

[2] The "Acquired earnings" row automatically shows "$12.20" in order to avoid subjects' need for calculations and, we hoped, increase their emotional engagement with the demonstration. We ask subjects to also enter this dollar amount (as it appears in the table) because early pilots suggested that doing so encourages subjects to actively read it and be more aware of it.

[3] We opted for five response options rather than eleven (as in the paper demonstration in Studies 1–3) to simplify the scale appearance on the computer screen.

of their acquired earnings. After answering these questions, subjects are informed that "**The demonstration is over.**" and are invited to start solving tables when ready.

Appendix E: Additional Detail on HL's Experiments

Of HL's three experiments, this paper focuses on Experiment 2's More Endowment condition, and uses it as the baseline for new sink-in treatments. This appendix explains why. Briefly, while that condition qualitatively replicates the results from HL's Experiments 1 and 3, it was designed to be more similar to EF's setup than HL's Experiment 1, and it is less complicated than (though mostly indistinguishable from) HL's Experiment 3.

HL Experiment 2's More Endowment condition is described in detail in subsection 2.3 of the present paper. HL designed it as an attempt to eliminate some (outside-the-model) implementation differences between HL's Experiment 1 and EF. Its main modifications relative to Experiment 1 included changing the q's (the probabilities that trade is permitted) from the original 1% versus 99% to EF's 10% versus 90%;[4] making the language in the experimental instructions closely follow the endowment-laden language in EF, which repeatedly emphasizes ownership of the endowed item; and using a shorter time-filler survey (a one-page "Big Five" personality traits questionnaire; John and Srivastava, 1999), as in EF. For full details, see Heffetz and List (2014, section 4.1).[5]

In turn, HL's Experiment 3 was designed as a replication of Experiment 2's More Endowment condition, but, to further explore the robustness of its findings, it contained another modification: in addition to transparently flipping a coin to determine which item is assigned to them, participants also flipped a plastic chip that determined, in a transparent way, which expectations treatment (10% versus 90%) they were randomized into.

[4]In HL's experiments, subjects were asked early in the experiment to write down an integer number of their choice from a certain range (e.g., 1–10), and in the end of the experiment to check whether that number matched a random number that had been placed in a sealed envelope before the experiment began. This original randomization procedure was used because it allowed the experimenter to easily set any probability ratio by setting the range: e.g., 1–100 for 1% vs. 99% in HL's Experiment 1, and 1–10 for 10% vs. 90% in HL's Experiments 2 and 3. (In the present paper we opted for simplicity, replacing this procedure with a roll of a familiar six-sided die.)

[5]HL's Experiment 2 had an additional, Less Endowment condition that was designed to be *less* similar to EF's experiment (and yielded very different findings). The full original study hence had a $2\times2\times2$ design, with two "assignment" conditions (Coin-Mug vs. Coin-Pen), two "expectations" conditions (Weak Expectations vs. Strong Expectations), and two "endowment" conditions (More Endowment vs. Less Endowment).

These latter two experiments yielded qualitatively similar results (reproduced in table 1 in the present paper) which were, in turn, qualitatively similar (but less comparable) to HL's Experiment 1.

In summary, HL already searched for, but failed to find, an outside-the-model explanation for the different findings relative to EF. The present paper continues the search by testing the hitherto untested hypothesis that lagged beliefs regarding probability distributions may not in themselves be sufficient for establishing a reference point, and that sunk-in beliefs may be necessary. To do so, we base our new sink-in experiments on Experiment 2's More Endowment condition, which is the simplest setup that was purposefully designed to be comparable to EF's setup.

References

John, Oliver P., and Sanjay Srivastava. 1999. "The Big Five trait taxonomy: History, measurement, and theoretical perspectives." In Lawrence A. Pervin and Oliver P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York: Guilford.

Appendix F: Theoretical Analysis of Effort-Provision Experiments

Consider the setting in section 3.1. That is, consider a 2-dimensional consumption bundle $\boldsymbol{c} = (x, e)$, where x is money (a good) and e is effort (a bad). A lab subject in AFGH's and GGSZ's experiments chooses when to stop providing effort. She is informed at the outset that once she stops, she will receive: her accumulated earnings we (where w is her wage) with probability $\frac{1}{2}$; a relatively high amount H with probability $p \leq \frac{1}{2}$; and a relatively low amount L with probability $\frac{1}{2} - p$.[6] Assume that $m_x(x) = x$ and that $m_e(e) = -c(e), c'(e) > 0, c''(e) > 0$. To rule out the corner solution $e = 0$, we further assume $c'(0) \ll w$.

To simplify notation and as a slight generalization, and adding the cost of effort to the lottery, consider a setting where the subject knows early on that she will later have to choose e and will receive as a result the lottery

$$F(e) = [(H, e), p; (L, e), q; (we, e), r],$$

with $p + q + r = 1$.

F.1 Personal Equilibrium (PE)

In KR's model, a lottery F—a stochastic outcome—is evaluated according to its expected utility, "with the utility of each outcome being the average of how it feels relative to each possible realization of the reference point G:"

$$U(F|G) = \iint u(\boldsymbol{c}|\boldsymbol{r}) dG(\boldsymbol{r}) dF(\boldsymbol{c}).$$

A lottery $F(e)$ is a PE if

$$\forall e' : \; U(F(e)|F(e)) \geq U(F(e')|F(e)).$$

In our setting, this inequality becomes

$$\begin{aligned}
&p^2 \, u[(H, e)|(H, e)] + pq \, u[(H, e)|(L, e)] + pr \, u[(H, e)|(we, e)] + \\
&qp \, u[(L, e)|(H, e)] + q^2 \, u[(L, e)|(L, e)] + qr \, u[(L, e)|(we, e)] + \\
&rp \, u[(we, e)|(H, e)] + rq \, u[(we, e)|(L, e)] + r^2 \, u[(we, e)|(we, e)] \geq \\
\\
&p^2 \, u[(H, e')|(H, e)] + pq \, u[(H, e')|(L, e)] + pr \, u[(H, e')|(we, e)] + \\
&qp \, u[(L, e')|(H, e)] + q^2 \, u[(L, e')|(L, e)] + qr \, u[(L, e')|(we, e)] + \\
&rp \, u[(we', e')|(H, e)] + rq \, u[(we', e')|(L, e)] + r^2 \, u[(we', e')|(we, e)].
\end{aligned}$$

[6]See Gneezy, Goette, Sprenger, and Zimmermann's (2017) appendix for a closely related analysis. I thank Guy Ishai for the analysis in the present appendix, and Ted O'Donoghue for suggesting the alternative graphical approach in F.4 below.

Simplifying, using our assumptions above regarding the m's, and dividing by r, we obtain:

$$
\begin{aligned}
we - \frac{c(e)}{r} + p\,\mu(we - H) + q\,\mu(we - L) \geq \\
& we' - \frac{c(e')}{r} + p\,\mu(we' - H) + q\,\mu(we' - L) + r\,\mu(we' - we) + \\
& \frac{\mu(c(e) - c(e'))}{r}. \qquad \text{(F.1)}
\end{aligned}
$$

F.1.1 Case $L \leq we \leq H$

F.1.1.1 Subcase $we' \leq L \leq we \leq H$

In this subcase, inequality (F.1) becomes

$$
\begin{aligned}
we - \frac{c(e)}{r} + p\eta\lambda(we - H) + q\eta(we - L) \geq \\
& we' - \frac{c(e')}{r} + p\eta\lambda(we' - H) + q\eta\lambda(we' - L) + r\eta\lambda(we' - we) + \\
& \frac{\eta}{r}(c(e) - c(e')).
\end{aligned}
$$

Rearranging terms to make the left-hand side a function of e and the right-hand side a function of e', we get

$$
(1 + (p + r)\eta\lambda + q\eta)we - \frac{1+\eta}{r}c(e) + q\eta(\lambda - 1)L \geq (1 + \eta\lambda)we' - \frac{1+\eta}{r}c(e'). \qquad \text{(F.2)}
$$

The functions on the two sides of the inequality have a characteristic shape that appears repeatedly in the analysis. The assumption $c'(0) \ll w$ implies that the functions increase with effort near $e = 0$, reach a maximum, and then decrease.[7] The two functions differ by the slope near $e = 0$ and by the intersection with the vertical axis. We want to find all the points e satisfying $we \geq L$ that also satisfy (F.2) for all the points e' satisfying $we' \leq L$. The two functions intersect in one point only, $we = L$. Figure F.1 shows this graphically. We look for points on the e function (solid line) to the right of the intersection, that are above all the points on the e' function (dashed line) to the left of the intersection.

Such points exist only if the functions intersect to the left of the e' function's maximum:

$$
\frac{L}{w} \leq c'^{-1}\left(\frac{\theta_4 w}{a}\right), \qquad \text{(F.3)}
$$

where $\theta_4 = 1 + \eta\lambda$, $a = \frac{1+\eta}{r}$, and recall that $c'^{-1}(\cdot)$ is an increasing function. Note that L has to be sufficiently low to satisfy this condition and hence inequality (F.2). Intuitively, a high L makes $L \leq we$ less attractive due to the increasing marginal cost of effort. When $L = 0$, as in the relevant treatments in GGSZ, inequality (F.2) is always satisfied.

[7] While the functions on the left(right)-hand side of inequality (F.2) are written as a function of e (e'), to simplify the discussion here and in the rest of this appendix we refer to their argument simply as e when it is obvious that we discuss both functions (as in the previous and next sentences in the text).

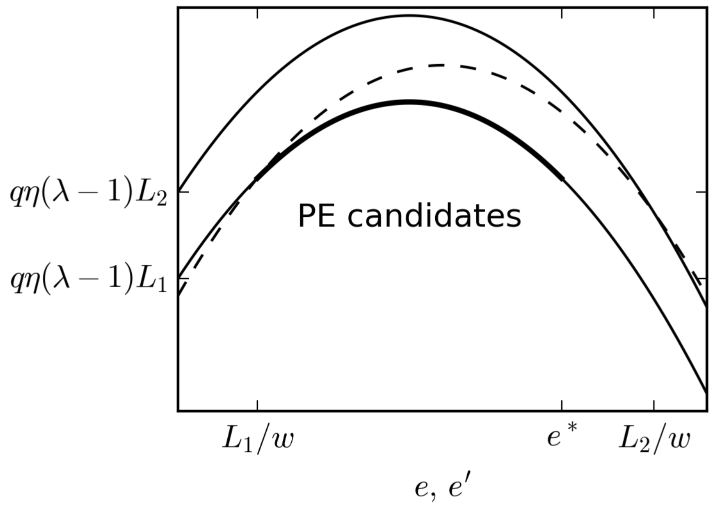


Figure F.1: Graphical illustration of the solution of inequality (F.2). Smooth lines: e functions. Dashed line: e' function. Two L cases are shown: a low value $L = L_1$ that enables PE in a closed interval, and a high value $L = L_2 > L_1$ that does not allow for PE in the interval $L \leq we \leq H$. The figure is plotted for $\eta = 1$, $\lambda = 3$, $r = 0.5$, $p = 0.25$, $q = 0.25$, $w = 0.2$ and an effort cost function $c(e) = 0.002e^2$ (so $c'(e) = 0.004e$, which means that without loss aversion subjects stop at $wr = 0.004e$, that is at $e = 25$ tables). While these parameters are held constant across all figures in this appendix (unless stated otherwise), we vary L and H across figures in order to demonstrate different situations. Here, $L_1 = 3$, $L_2 = 18$. (The qualitative features of the figures do not depend on parameter values.)

If points satisfying the inequality exist, they form the interval $\left[\frac{L}{w}, e^*\right]$, with $e^* > \frac{L}{w}$ the effort level that satisfies the equality

$$(1 + (p + r)\eta\lambda + q\eta)we^* - \frac{1+\eta}{r}c(e^*) + q\eta(\lambda - 1)L = (1 + \eta\lambda)L - \frac{1+\eta}{r}c\left(\frac{L}{w}\right),$$

or $e^* = \frac{L}{w}$ if it is the only solution. Note that $e^* > \frac{L}{w}$ is possible when the intersection is to the left of the e function's maximum, which means that e^* is to the right of this maximum:

$$c'^{-1}\left(\frac{\theta_3 w}{a}\right) \leq e^*,$$

where $\theta_3 = 1 + q\eta + (p + r)\eta\lambda$. This point will be important later in the analysis.

F.1.1.2 Subcase $L \leq we' \leq we \leq H$

In this subcase, inequality (F.1) becomes

$$we - \frac{c(e)}{r} + p\eta\lambda(we - H) + q\eta(we - L) \geq$$
$$we' - \frac{c(e')}{r} + p\eta\lambda(we' - H) + q\eta(we' - L) + r\eta\lambda(we' - we) + \frac{\eta}{r}(c(e) - c(e')),$$

yielding

$$(1 + q\eta + (p+r)\eta\lambda)we - \frac{1+\eta}{r}c(e) \geq (1 + q\eta + (p+r)\eta\lambda)we' - \frac{1+\eta}{r}c(e'). \tag{F.4}$$

The two functions are now identical. So, given the subcase currently considered, the points e that satisfy this inequality are those where the function is increasing. These are the points to the left of the maximum (figure F.2):

$$e \leq c'^{-1}\left(\frac{\theta_3 w}{a}\right),$$

where $\theta_3 = 1 + q\eta + (p+r)\eta\lambda$ and $a = \frac{1+\eta}{r}$.

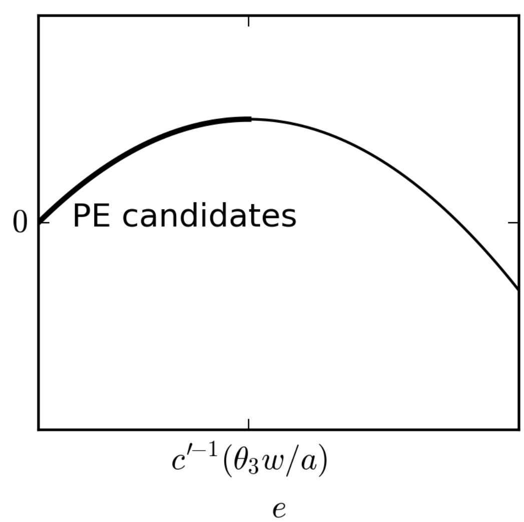


Figure F.2: Graphical illustration of the solution of inequality (F.4). PE is enabled in the interval where the function is increasing. For parameter values used to plot the figure, see figure F.1 notes.

F.1.1.3 Subcase $L \leq we \leq we' \leq H$

Here the condition becomes

$$
\begin{aligned}
we - \frac{c(e)}{r} + p\eta\lambda(we - H) + q\eta(we - L) \geq \\
& we' - \frac{c(e')}{r} + p\eta\lambda(we' - H) + q\eta(we' - L) + r\eta(we' - we) + \\
& \frac{\eta\lambda}{r}(c(e) - c(e')),
\end{aligned}
$$

yielding

$$
(1 + (q + r)\eta + p\eta\lambda)we - \frac{1 + \eta\lambda}{r}c(e) \geq (1 + (q + r)\eta + p\eta\lambda)we' - \frac{1 + \eta\lambda}{r}c(e'). \tag{F.5}
$$

The two functions are identical again, but now their initial slope is smaller than in inequality (F.4) and the concave term is larger, pushing the maximum to the left. Given the subcase currently considered, the points e that satisfy this inequality are those where the function is decreasing, to the right of the maximum (figure F.3):

$$
c'^{-1}\left(\frac{\theta_2 w}{b}\right) \leq e,
$$

where $\theta_2 = 1 + (q + r)\eta + p\eta\lambda$ and $b = \frac{1+\eta\lambda}{r}$.

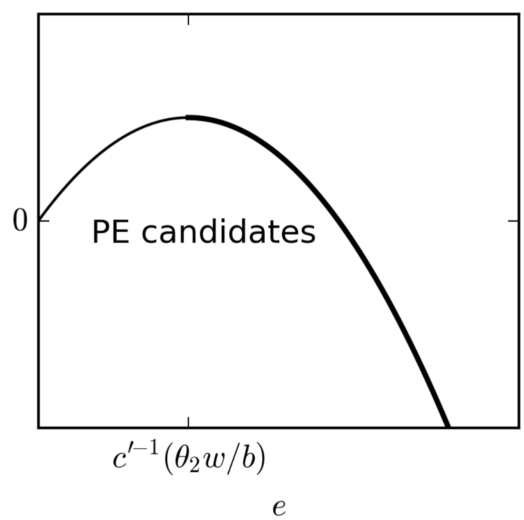


Figure F.3: Graphical illustration of the solution of inequality (F.5). PE is enabled in the interval where the function is decreasing. For parameter values used to plot the figure, see figure F.1 notes.

F.1.1.4 Subcase $L \le we \le H \le we'$

Now the condition is

$$
\begin{aligned}
we - \frac{c(e)}{r} + p\eta\lambda(we - H) + q\eta(we - L) \ge \\
& we' - \frac{c(e')}{r} + p\eta(we' - H) + q\eta(we' - L) + r\eta(we' - we) + \\
& \frac{\eta\lambda}{r}(c(e) - c(e')),
\end{aligned}
$$

yielding

$$(1 + p\eta\lambda + (q + r)\eta)we - \frac{1 + \eta\lambda}{r}c(e) - p\eta(\lambda - 1)H \ge (1 + \eta)we' - \frac{1 + \eta\lambda}{r}c(e'). \tag{F.6}$$

This subcase is similar to subcase F.1.1.1. The two functions intersect at $we = H$. We look for the points on the e function (solid line) to the left of the intersection, that are above all points on the e' function (dashed line) to the right of the intersection (figure F.4). Such points exist only if the functions intersect to the right of the e' function's maximum, i.e., only for sufficiently high H. The condition is

$$c'^{-1}\left(\frac{\theta_1 w}{b}\right) \le \frac{H}{w}, \tag{F.7}$$

where $\theta_1 = 1 + \eta$ and $b = \frac{1+\eta\lambda}{r}$.

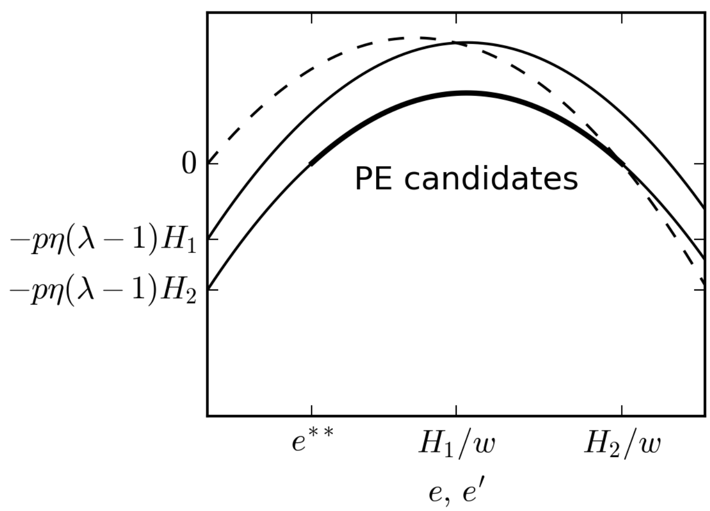


Figure F.4: Graphical illustration of the solution of inequality (F.6). Solid lines: e functions. Dashed line: e' function. Two H cases are shown: a high value $H = H_2$ that enables PE in a closed interval, and a low value $H = H_1 < H_2$ that does not allow for PE in the interval $L \le we \le H$. Here $H_1 = 3$, $H_2 = 5$. For other parameter values used to plot the figure, see figure F.1 notes.

If such points exist, they form an interval $\left[e^{**}, \frac{H}{w}\right]$, with

$$e^{**} \leq c'^{-1}\left(\frac{\theta_2 w}{b}\right),$$

where $\theta_2 = 1 + (q+r)\eta + p\eta\lambda$, similarly to subcase F.1.1.1.

F.1.1.5 Conditions Intersection

For ease of reference, we reproduce the parameter definitions from the four subcases above:

$$\begin{cases} 1+\eta = \theta_1 \\ 1+(q+r)\eta + p\eta\lambda = \theta_2 \\ 1+q\eta+(p+r)\eta\lambda = \theta_3 \\ 1+\eta\lambda = \theta_4 \\ \frac{1+\eta}{r} = a \\ \frac{1+\eta\lambda}{r} = b \end{cases}.$$

Note that $\theta_1 \leq \theta_2 \leq \theta_3 \leq \theta_4$ and $a \leq b$.

First we intersect conditions (F.2) and (F.4), from subcases F.1.1.1 and F.1.1.2, respectively. They are shown by the correspondingly labeled lines in figure F.5. A necessary condition for a non-empty PE set from F.1.1.1 is

$$\frac{L}{w} \leq c'^{-1}\left(\frac{\theta_4 w}{a}\right),$$

and if it holds then the allowed set is $\left[\frac{L}{w}, e^*\right]$, or

$$\frac{L}{w} \leq e \leq e^*,$$

with $c'^{-1}\left(\frac{\theta_3 w}{a}\right) \leq e^*$ as shown in subcase F.1.1.1. However, subcase F.1.1.2 implies a stronger condition

$$\frac{L}{w} \leq e \leq c'^{-1}\left(\frac{\theta_3 w}{a}\right) \leq c'^{-1}\left(\frac{\theta_4 w}{a}\right).$$

Overall, the condition for a non-empty PE set imposed by these two subcases is $\frac{L}{w} \leq c'^{-1}\left(\frac{\theta_3 w}{a}\right)$, and if it holds then the set is the closed interval $\left[\frac{L}{w}, c'^{-1}\left(\frac{\theta_3 w}{a}\right)\right]$. Similarly subcases F.1.1.3 and F.1.1.4 yield the condition $c'^{-1}\left(\frac{\theta_2 w}{b}\right) \leq \frac{H}{w}$ and the closed interval $\left[c'^{-1}\left(\frac{\theta_2 w}{a}\right), \frac{H}{w}\right]$ (the correspondingly labeled lines in figure F.5).

If we relax our assumption $c'(0) \ll w$, then some of the functions in the analysis may be decreasing for all $e \geq 0$, and thus have a maximum at $e = 0$. However, the ordering of the various functions' maxima, as indicated in figure F.5, still weakly holds because it follows the ordering $\theta_1 \leq \theta_2 \leq \theta_3 \leq \theta_4$. This means that if we slowly decrease w or increase $c'(0)$, the maximum points of the functions will shift to the left while preserving their order, and will also reach $e = 0$ in the same order. This keeps the principle of the previous analysis valid,

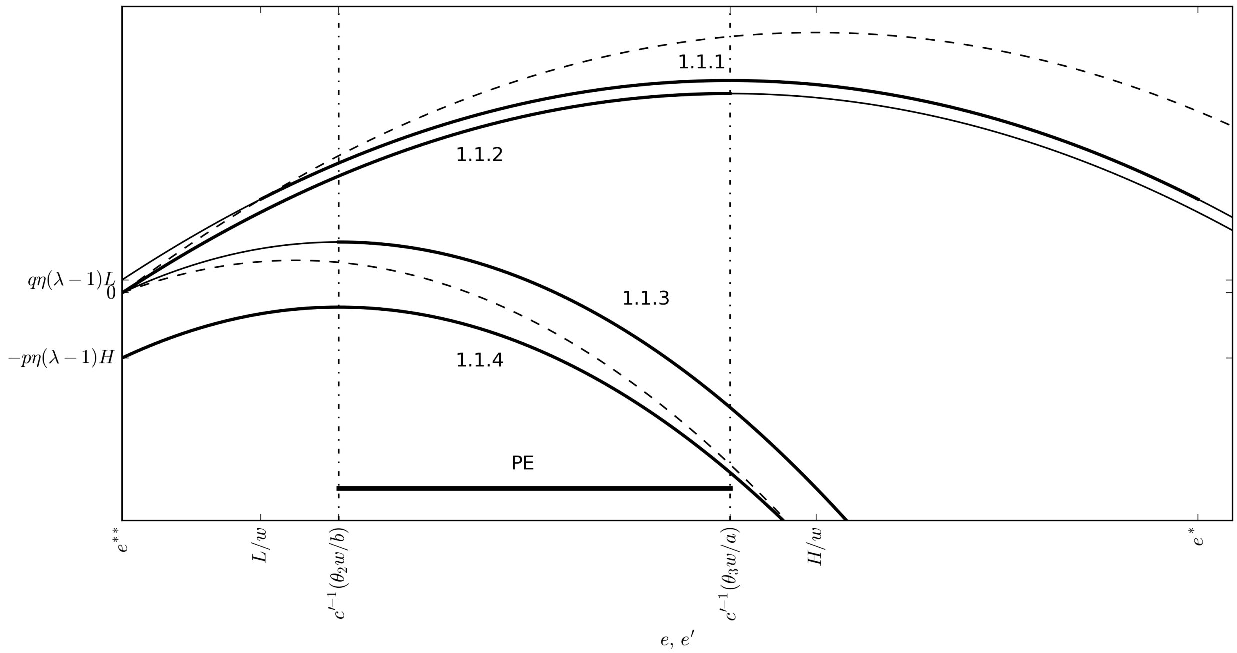


Figure F.5: Illustration of the intersection of conditions imposed on PE from the four inequalities, yielding a closed interval in which PE is possible in the $L \leq we \leq H$ case. Here $L = 2$, $H = 10$.

and we only need to consider the possibility of a maximum at $e = 0$. The two final conditions for a non-empty PE set are

$$\frac{L}{w} \leq max\left\{c'^{-1}\left(\frac{\theta_3 w}{a}\right), 0\right\} \quad \text{and}$$

$$max\left\{c'^{-1}\left(\frac{\theta_2 w}{b}\right), 0\right\} \leq \frac{H}{w},$$

and the set is the closed interval

$$PE_M = \left[max\left\{c'^{-1}\left(\frac{\theta_2 w}{b}\right), 0, \frac{L}{w}\right\}, min\left\{max\left\{c'^{-1}\left(\frac{\theta_3 w}{a}\right), 0\right\}, \frac{H}{w}\right\}\right].$$

The intersection is illustrated in figure F.5. An interpretation for these slightly complex expressions is that there exist 'soft' bounds to the PE interval—they are determined by η and λ through the conditions in subcases F.1.1.2, F.1.1.3 (or the corner solution equivalent), but are not related to L and H. The segment of the 'soft' interval that falls inside $[L, H]$ is the final PE interval in this case.

F.1.2 Case $we < L$

F.1.2.1 Subcase $we' \leq we < L$

Inequality (F.1) now becomes

$$we - \frac{c(e)}{r} + p\eta\lambda(we - H) + q\eta\lambda(we - L) \geq$$
$$we' - \frac{c(e')}{r} + p\eta\lambda(we' - H) + q\eta\lambda(we' - L) + r\eta\lambda(we' - we) + \frac{\eta}{r}(c(e) - c(e')),$$

yielding

$$(1 + \eta\lambda)we - \frac{1 + \eta}{r}c(e) \geq (1 + \eta\lambda)we' - \frac{1 + \eta}{r}c(e').$$

The solution is very similar to subcase F.1.1.2:

$$e \leq c'^{-1}\left(\frac{\theta_4 w}{a}\right).$$

F.1.2.2 Subcase $we \leq we' < L$

Similarly to subcase F.1.1.3, the condition is

$$(1 + r\eta + (p + q)\eta\lambda)we - \frac{1 + \eta\lambda}{r}c(e) \geq (1 + r\eta + (p + q)\eta\lambda)we' - \frac{1 + \eta\lambda}{r}c(e'),$$

and the solution is

$$c'^{-1}\left(\frac{\theta_3' w}{b}\right) \leq e,$$

where $\theta_3' = 1 + r\eta + (p + q)\eta\lambda$.

F.1.2.3 Subcase $we < L \leq we' < H$

Similarly to subcase F.1.1.4, here the condition

$$(1 + r\eta + (p + q)\eta\lambda)we - \frac{1 + \eta\lambda}{r}c(e) - q\eta(\lambda - 1)L \geq (1 + (q + r)\eta + p\eta\lambda)we' - \frac{1 + \eta\lambda}{r}c(e')$$

implies that only sufficiently large L values will enable PE in the $we < L$ range:

$$c'^{-1}\left(\frac{\theta_2 w}{b}\right) \leq \frac{L}{w}.$$

F.1.2.4 Subcase $we < L < H \leq we'$

We show that this case implies a weaker condition than F.1.2.3. The inequality is

$$(1 + r\eta + (p+q)\eta\lambda)we - \frac{1+\eta\lambda}{r}c(e) - \eta(\lambda-1)(qL + pH) \geq (1+\eta)we' - \frac{1+\eta\lambda}{r}c(e').$$

Assume the inequality from the previous case enables PE in the range $we^{**} \leq we < L$:

$$(1 + r\eta + (p+q)\eta\lambda)we - \frac{1+\eta\lambda}{r}c(e) - q\eta(\lambda-1)L \geq (1 + (q+r)\eta + p\eta\lambda)we' - \frac{1+\eta\lambda}{r}c(e').$$

Recall from case F.1.1.4 that this implies that the e function on the left-hand side and the e' function on the right-hand side are both downward sloping at the intersection $we = L$. Therefore, the e' function is downward sloping for all $L < we'$ and satisfy, for all $e^{**} \leq we < L$ and $we' = H > L$,

$$(1 + r\eta + (p+q)\eta\lambda)we - \frac{1+\eta\lambda}{r}c(e) - q\eta(\lambda-1)L \geq (1 + (q+r)\eta + p\eta\lambda)H - \frac{1+\eta\lambda}{r}c(H/w).$$

Subtracting $\eta(\lambda-1)pH$ from both sides we get

$$(1 + r\eta + (p+q)\eta\lambda)we - \frac{1+\eta\lambda}{r}c(e) - \eta(\lambda-1)(qL + pH) \geq (1+\eta)H - \frac{1+\eta\lambda}{r}c(H/w).$$

The new e' function on the right hand side is decreasing wherever the e' function from the previous case is decreasing, yielding

$$\begin{aligned}(1 + r\eta + (p+q)\eta\lambda)we - \frac{1+\eta\lambda}{r}c(e) - \eta(\lambda-1)(qL + pH) &\geq (1+\eta)H - \frac{1+\eta\lambda}{r}c(H/w)\\ &\geq (1+\eta)we' - \frac{1+\eta\lambda}{r}c(e')\end{aligned}$$

for all $e^{**} \leq we < L$ and $H \leq we'$, as required.

F.1.2.5 Conditions Intersection

We again reproduce the relevant parameter definitions for ease of reference:

$$\begin{cases} 1 + \eta = \theta_1 \\ 1 + (q+r)\eta + p\eta\lambda = \theta_2 \\ 1 + r\eta + (p+q)\eta\lambda = \theta_3' \\ 1 + \eta\lambda = \theta_4 \\ \frac{1+\eta}{r} = a \\ \frac{1+\eta\lambda}{r} = b \end{cases}.$$

Note that $\theta_1 \leq \theta_2 \leq \theta_3' \leq \theta_4$ and $a \leq b$.

The intersection is illustrated in figure F.6, and the analysis is similar to that in section F.1.1.5, with the same generalization for the case of functions with a maximum at $e = 0$.

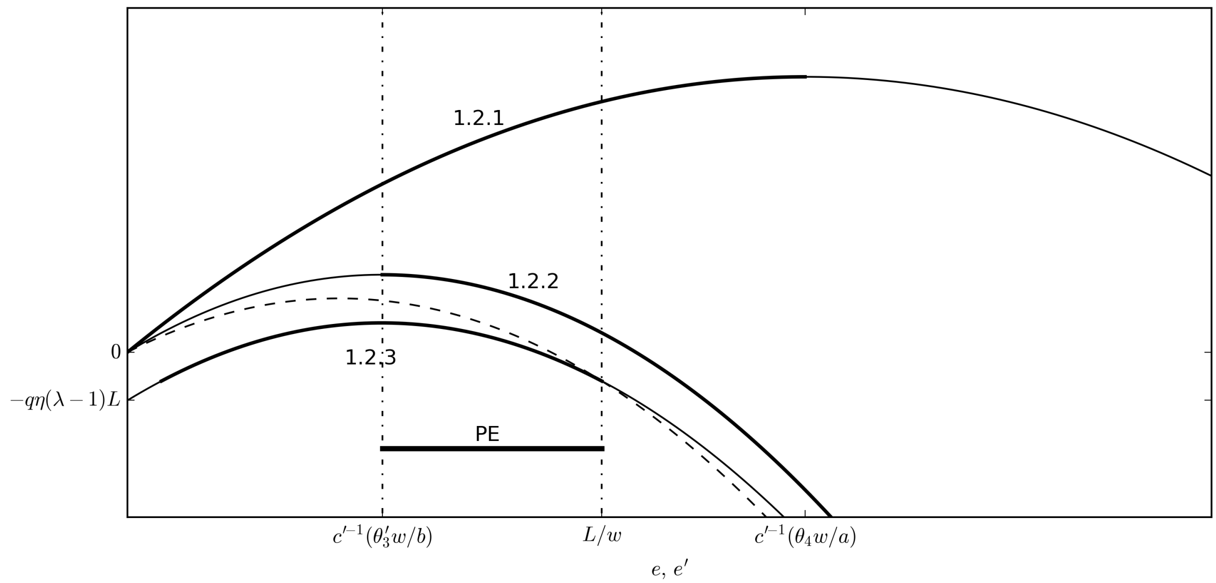


Figure F.6: Illustration of the intersection of conditions imposed on PE from the three inequalities, yielding a closed interval in which PE is possible in the case $we < L$. Here $L = 7$.

The condition for a non-empty PE set is

$$max\left\{c'^{-1}\left(\frac{\theta_3' w}{b}\right), 0\right\} \leq \frac{L}{w},$$

and the set is the closed interval

$$PE_L = \left[max\left\{c'^{-1}\left(\frac{\theta_3' w}{b}\right), 0\right\}, min\left\{max\left\{c'^{-1}\left(\frac{\theta_4 w}{a}\right), 0\right\}, \frac{L}{w}\right\}\right].$$

The interpretation of the expressions is similar to that of the previous case. Note that the PE interval is in typically higher effort levels than in the $L \leq we \leq H$ case. Intuitively, being in the loss domain relative to both L and H leads to a generally higher effort and acquired earning level.

F.1.3 Case $H < we$

F.1.3.1 Subcase $we' \leq L < H < we$

The inequality is

$$(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) + \eta(\lambda - 1)(qL + pH) \geq (1 + \eta\lambda)we' - \frac{1+\eta}{r}c(e').$$

We show that it is a weaker condition than in subcase F.1.3.2 below, similarly to what we did in the case $we < L$. Assume that

$$(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) + \eta p(\lambda - 1)H \geq (1 + q\eta + (p + r)\eta\lambda)we' - \frac{1+\eta}{r}c(e')$$

enables PE in a range $H < we \leq we^*$. Recall from subcase F.1.1.1 that this implies that the e function on the left-hand side and the e' function on the right-hand side are both increasing at the intersection $we = H$. Therefore, the e' function is increasing for all $we' < H$, and we get, for all $H < we \leq e^*$ and $we' = L < H$,

$$(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) + \eta p(\lambda - 1)H \geq (1 + q\eta + (p + r)\eta\lambda)L - \frac{1+\eta}{r}c(L/w).$$

Adding $\eta q(\lambda - 1)L$ to both sides we get

$$\begin{aligned}(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) + \eta(\lambda - 1)(qL + pH) &\geq (1 + \eta\lambda)L - \frac{1+\eta}{r}c(L/w) \\ &\geq (1 + \eta\lambda)we' - \frac{1+\eta}{r}c(e'),\end{aligned}$$

for all $H < we \leq e^*$ and $we' \leq L$, as required.

F.1.3.2 Subcase $L \leq we' < H < we$

The inequality is

$$(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) + \eta p(\lambda - 1)H \geq (1 + q\eta + (p + r)\eta\lambda)we' - \frac{1+\eta}{r}c(e').$$

It is analyzed and solved similarly to subcase F.1.1.1, allowing PE for only sufficiently low H values. The condition is

$$\frac{H}{w} \leq c'^{-1}\left(\frac{\theta_3 w}{a}\right).$$

F.1.3.3 Subcase $H \leq we' < we$

Similarly to subcase F.1.1.2, we obtain and solve

$$(1 + (p + q)\eta + r\eta\lambda)we - \frac{1+\eta}{r}c(e) \geq (1 + (p + q)\eta + r\eta\lambda)we' - \frac{1+\eta}{r}c(e').$$

The solution is

$$e \leq c'^{-1}\left(\frac{\theta_2' w}{a}\right),$$

where $\theta_2' = 1 + (p + q)\eta + r\eta\lambda$.

F.1.3.4 Subcase $H < we \le we'$

Similarly to subcase F.1.1.3 we obtain and solve

$$(1+\eta)we - \frac{1+\eta\lambda}{r}c(e) \ge (1+\eta)we' - \frac{1+\eta\lambda}{r}c(e').$$

The solution is

$$c'^{-1}\left(\frac{\theta_1 w}{b}\right) \le e.$$

F.1.3.5 Conditions Intersection

We again reproduce the relevant definitions:

$$\begin{cases} 1+\eta = \theta_1 \\ 1+(p+q)\eta + r\eta\lambda = \theta_2' \\ 1+q\eta+(p+r)\eta\lambda = \theta_3 \\ 1+\eta\lambda = \theta_4 \\ \frac{1+\eta}{r} = a \\ \frac{1+\eta\lambda}{r} = b \end{cases}.$$

Note that $\theta_1 \le \theta_2' \le \theta_3 \le \theta_4$ and $a \le b$.

The intersection of conditions is illustrated in figure F.7, as it was in section F.1.2.5, generalizing for the case of functions with a maximum at $e = 0$. The condition for a non-empty PE set is

$$\frac{H}{w} \le max\left\{c'^{-1}\left(\frac{\theta_2' w}{a}\right), 0\right\},$$

and the set is the closed interval

$$PE_H = \left[max\left\{c'^{-1}\left(\frac{\theta_1 w}{b}\right), 0, \frac{H}{w}\right\}, max\left\{c'^{-1}\left(\frac{\theta_2' w}{a}\right), 0\right\}\right].$$

The PE range is in typically lower effort levels than in the $L \le we \le H$ case. The intuition is as in the previous case.

F.1.4 Complete PE Interval

The three cases above yield three possible components for the complete PE set: PE_L, PE_M, and PE_H. First we show PE existence. At least one of the three conditions from above must hold:

$$\begin{cases} \frac{L}{w} \le max\left\{c'^{-1}\left(\frac{\theta_3 w}{a}\right), 0\right\} \text{ } and \text{ } max\left\{c'^{-1}\left(\frac{\theta_2 w}{b}\right), 0\right\} \le \frac{H}{w} & \text{or} \\ max\left\{c'^{-1}\left(\frac{\theta_3' w}{b}\right), 0\right\} \le \frac{L}{w} & \text{or} \\ \frac{H}{w} \le max\left\{c'^{-1}\left(\frac{\theta_2' w}{a}\right), 0\right\}. \end{cases}$$

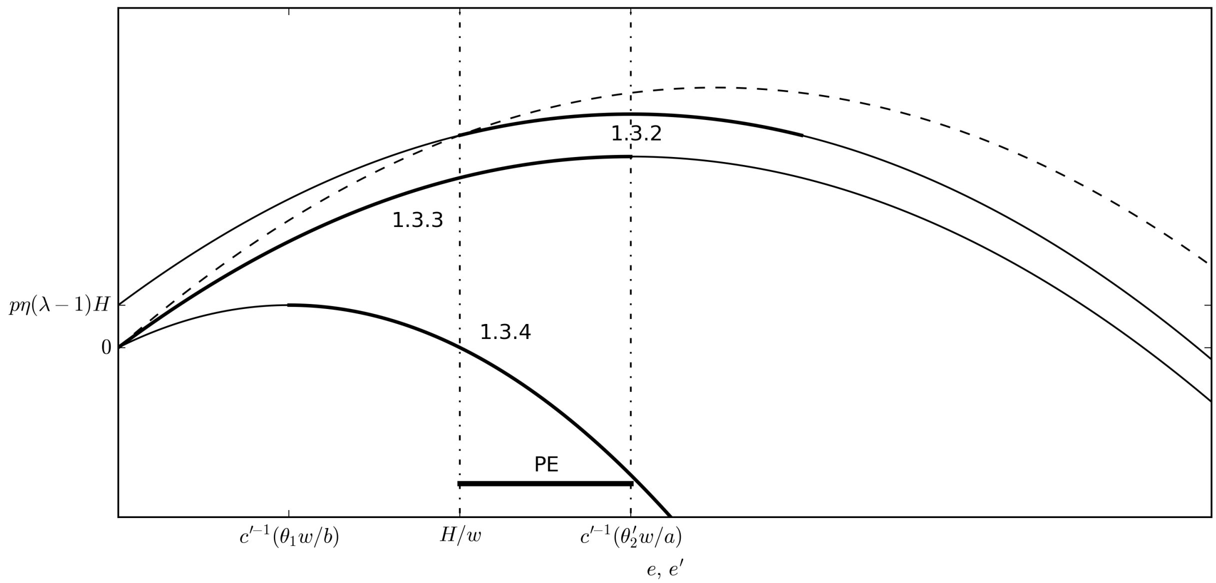


Figure F.7: Illustration of the intersection of conditions imposed on PE from the three inequalities, yielding a closed interval in which PE is possible in the case $H < we$. Here $H = 5$.

Suppose the first condition does not hold. Then either its first part, its second part, or both are false. Suppose the second part is false, $max\left\{c'^{-1}\left(\frac{\theta_2 w}{b}\right), 0\right\} > \frac{H}{w}$. We show that

$$\frac{\theta_2'}{a} \geq \frac{\theta_2}{b},$$

and this is sufficient to ensure $max\left\{c'^{-1}\left(\frac{\theta_2' w}{a}\right), 0\right\} \geq max\left\{c'^{-1}\left(\frac{\theta_2 w}{b}\right), 0\right\} > \frac{H}{w}$, and therefore the third condition holds. Proving by contradiction we begin with

$$\frac{\theta_2'}{a} < \frac{\theta_2}{b}$$

$$\frac{r}{1+\eta}(1 + (p+q)\eta + r\eta\lambda) < \frac{r}{1+\eta\lambda}(1 + (q+r)\eta + p\eta\lambda)$$

$$1(1+\eta\lambda) + (p+q)\eta(1+\eta\lambda) + r\eta\lambda(1+\eta\lambda) < 1(1+\eta) + (q+r)\eta(1+\eta) + p\eta\lambda(1+\eta)$$

$$(\lambda - 1) + p(1 + \eta\lambda - \lambda - \eta\lambda) + q(1 + \eta\lambda - 1 - \eta) + r(\lambda + \eta\lambda^2 - 1 - \eta) < 0$$

$$(\lambda - 1) + p(1-\lambda) + q\eta(\lambda - 1) + r\left((\lambda - 1) + \eta(\lambda^2 - 1)\right) < 0.$$

Dividing by $(\lambda - 1) > 0$, we get

$$(1-p) + q\eta + r\left(1 + \eta(\lambda + 1)\right) < 0.$$

Since all the terms on the left are nonnegative, this is a contradiction. If we suppose instead that the first part of the first condition is false, it can similarly be shown that the second condition must hold.

Next, we construct the complete PE set, showing that it is a closed interval. Using the interpretation from F.1.1.5, we have 'soft' bounds of the PE intervals that do not depend on L or H:

$$\begin{cases} e^H_{min} = c'^{-1}\left(\frac{\theta_1 w}{b}\right) & = c'^{-1}\left[\frac{r}{1+\eta\lambda}(1+\eta)w\right] \\ e^H_{max} = c'^{-1}\left(\frac{\theta'_2 w}{a}\right) & = c'^{-1}\left[\frac{r}{1+\eta}(1+(p+q)\eta + r\eta\lambda)w\right] \\ e^M_{min} = c'^{-1}\left(\frac{\theta_2 w}{b}\right) & = c'^{-1}\left[\frac{r}{1+\eta\lambda}(1+(q+r)\eta + p\eta\lambda)w\right] \\ e^M_{max} = c'^{-1}\left(\frac{\theta_3 w}{a}\right) & = c'^{-1}\left[\frac{r}{1+\eta}(1+q\eta + (p+r)\eta\lambda)w\right] \\ e^L_{min} = c'^{-1}\left(\frac{\theta'_3 w}{b}\right) & = c'^{-1}\left[\frac{r}{1+\eta\lambda}(1+r\eta + (p+q)\eta\lambda)w\right] \\ e^L_{max} = c'^{-1}\left(\frac{\theta_4 w}{a}\right) & = c'^{-1}\left[\frac{r}{1+\eta}(1+\eta\lambda)w\right] \end{cases}.$$

Their ordering, as shown above, is

$$e^H_{min} \le e^M_{min} \le e^H_{max}, e^L_{min} \le e^M_{max} \le e^L_{max}.$$

Denote the soft PE intervals implied by these bounds PE^s_L, PE^s_M, and PE^s_H, and note that PE^s_L and PE^s_M always overlap, and that PE^s_M and PE^s_H always overlap. To complete the PE set we place the $\left[\frac{L}{w}, \frac{H}{w}\right]$ interval on the same axis with the three soft PE intervals. The complete set consists of the following segments (some of which may be empty): the segment of PE^s_L to the left of $\left(\frac{L}{w}, \frac{H}{w}\right]$, the segment of PE^s_H to the right of $\left[\frac{L}{w}, \frac{H}{w}\right)$, and the segment of PE^s_M in $\left[\frac{L}{w}, \frac{H}{w}\right]$. If the PE set consists of only one of the three segments, then it is a closed interval. If it consists of segments from two intervals, then if the two are PE^s_L and PE^s_M, the segments are $\left[e^L_{min}, \frac{L}{w}\right]$ and $\left[\frac{L}{w}, min\left\{e^M_{max}, \frac{H}{w}\right\}\right]$, whose union is the closed interval $\left[e^L_{min}, min\left\{e^M_{max}, \frac{H}{w}\right\}\right]$; and similarly for the two intervals PE^s_M and PE^s_H. Note that as a result, if the PE set consists of segments from all three intervals, it is also a closed interval. The last case to consider is a PE set that consists of only segments from the two intervals PE^s_L and PE^s_H. If $e^H_{max} < e^L_{min}$ then the set would be non-convex, but the inclusion of both segments would then imply $\frac{H}{w} \le e^H_{max} < e^L_{min} \le \frac{L}{w}$, which is not possible. We thus proved that the complete PE set is always a closed interval. Figure F.8 illustrates some possibilities for the construction of this interval.

In AFGH's and GGSZ's experiments, with $r = p + q = \frac{1}{2}$, PE^s_H and PE^s_L overlap, which means that there are L and H settings for which effort levels below $\frac{L}{w}$, above $\frac{H}{w}$, and between them are a part of the complete PE interval.

F.2 PPE

The PPE is the PE that maximizes $U(F(e)|F(e))$. Using the derivations above we get

$$\begin{aligned} U(F(e)|F(e)) = &\left[pH + qL + rwe - c(e)\right] + \\ &pq\left[\mu(H-L) + \mu(L-H)\right] + \\ &pr\left[\mu(H-we) + \mu(we-H)\right] + \\ &qr\left[\mu(L-we) + \mu(we-L)\right]. \end{aligned}$$

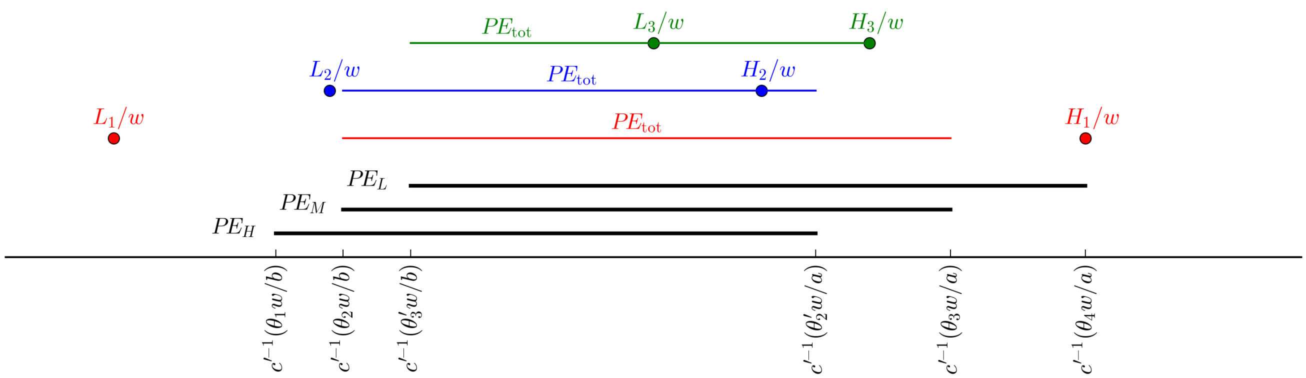


Figure F.8: Illustration of the 'soft' PE intervals in the cases $we < L$ (PE_L), $L \leq we \leq H$ (PE_M) and $H < we$ (PE_H), and examples of the complete PE intervals in various L and H settings. Here $L_1 = 1$, $H_1 = 10$ (in red); $L_2 = 2$, $H_2 = 7$ (in blue); $L_3 = 6$, $H_3 = 8$ (in green).

This function (divided by r) is the function analyzed by GGSZ to find the effort level in a CPE:

$$U(F(e)|F(e)) = \begin{cases} (1 + \eta(\lambda - 1)(p + q))\, we - \frac{c(e)}{r} - \eta(\lambda - 1)(pH + qL) & we < L \\ (1 + \eta(\lambda - 1)(p - q))\, we - \frac{c(e)}{r} - \eta(\lambda - 1)(pH - qL) & L \leq we \leq H \\ (1 - \eta(\lambda - 1)(p + q))\, we - \frac{c(e)}{r} + \eta(\lambda - 1)(pH + qL) & H < we \end{cases}.$$

The PPE is the effort level that maximizes $U(F(e)|F(e))$ in the PE interval. Figure F.9 illustrates this function—call it the CPE function—as well as its maximum (the CPE), the PE interval, and the CPE-function's maximum in that interval (the PPE), in different cases. Note that the prediction from AFGH's CPE analysis of clustering around $we = L$ and $we = H$ is still valid as long as L and H are in the PE interval.

F.2.1 Signing $\left(\frac{\partial e_{PPE}}{\partial p}\right)_r$

GGSZ show that for a fixed r, effort level in CPE increases with p when $L \leq we \leq H$ and remains constant regardless of p otherwise:

$$\begin{cases} \left(\frac{\partial e_{CPE}}{\partial p}\right)_r = 0 & we < L \\ \left(\frac{\partial e_{CPE}}{\partial p}\right)_r > 0 & L \leq we \leq H \\ \left(\frac{\partial e_{CPE}}{\partial p}\right)_r = 0 & H < we \end{cases}.$$

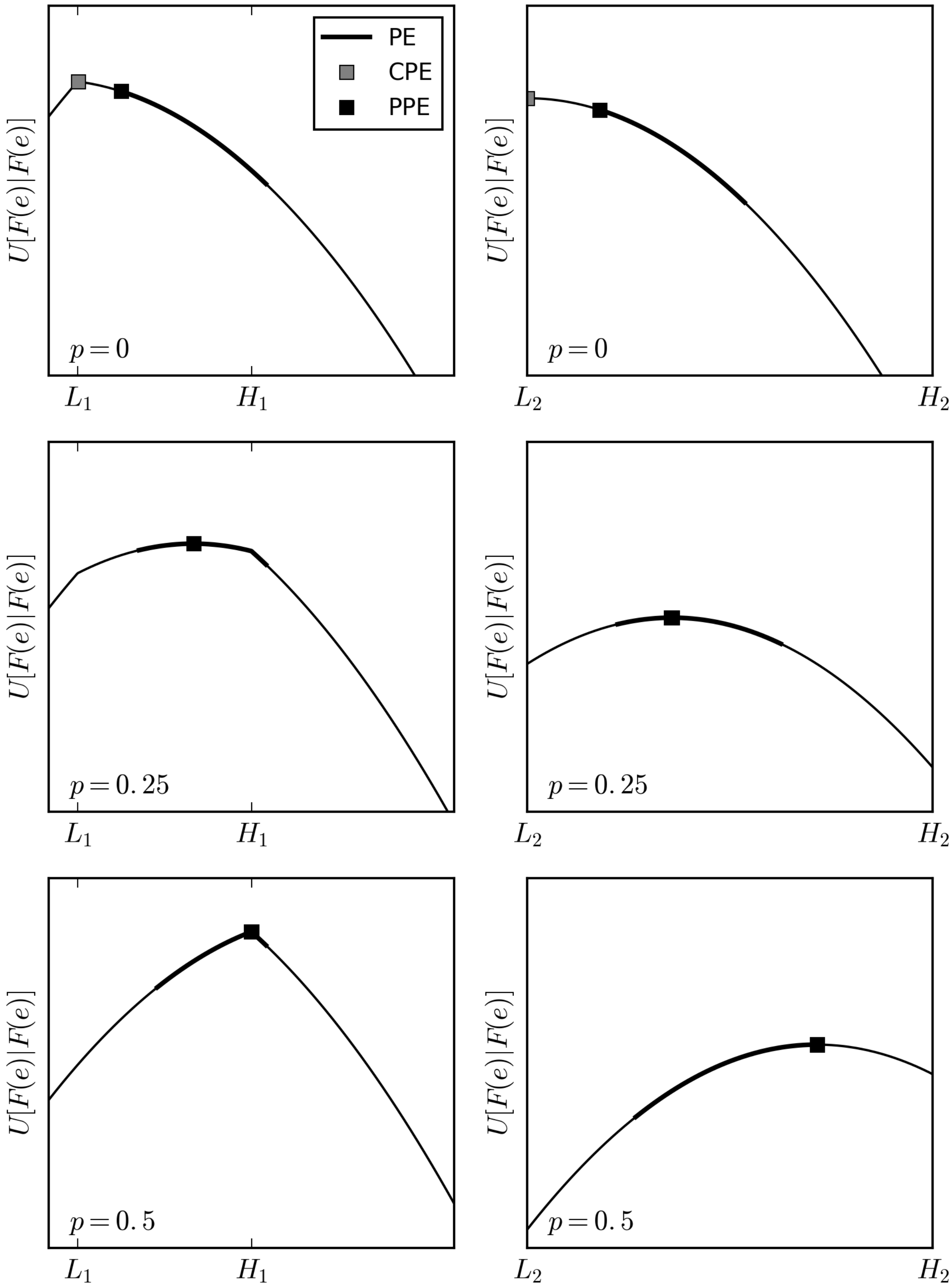


Figure F.9: The CPE function, PE interval, and PPE in different scenarios. Top row: $p = 0$; middle row: $p = 0.25$; bottom row: $p = 0.5$. Left column: $L_1 = 1$, $H_1 = 7$, right column: $L_2 = 0$, $H_2 = 14$.

Inspecting the PE intervals' bounds we find that

$$\begin{cases} \left(\frac{\partial e^H_{min}}{\partial p}\right)_r = 0 \\ \left(\frac{\partial e^H_{max}}{\partial p}\right)_r = 0 \\ \left(\frac{\partial e^M_{min}}{\partial p}\right)_r > 0 \\ \left(\frac{\partial e^M_{max}}{\partial p}\right)_r > 0 \\ \left(\frac{\partial e^L_{min}}{\partial p}\right)_r = 0 \\ \left(\frac{\partial e^L_{max}}{\partial p}\right)_r = 0 \end{cases}.$$

This is because $\left(\frac{\partial \theta_i}{\partial p}\right)_r > 0$ and $\left(\frac{\partial \theta'_i}{\partial p}\right)_r = 0$ for $i \in \{2,3\}$, $\left(\frac{\partial \theta_i}{\partial p}\right)_r = 0$ for $i \in \{1,4\}$, and c'^{-1} is a strictly increasing function. Thus the above qualitative predictions for CPE hold for PPE as well: when p increases, the possible effort levels—the PEs—remain the same outside the interval $L \leq we \leq H$ and increase inside it, implying that a PPE should also remain the same if it is initially outside the interval, and should increase otherwise.

$$\begin{cases} \left(\frac{\partial e_{PPE}}{\partial p}\right)_r = 0 & we < L \\ \left(\frac{\partial e_{PPE}}{\partial p}\right)_r > 0 & L \leq we \leq H \\ \left(\frac{\partial e_{PPE}}{\partial p}\right)_r = 0 & H < we \end{cases}.$$

F.2.2 Signing $\left(\frac{\partial e_{PE}}{\partial p}\right)_r$

When a PE solution which is not necessarily a PPE is considered, the question is not whether the PE interval moves to higher effort levels with p, but whether it moves a greater distance than its length. If the PE interval is wide relative to its move with p, most effort levels that are PE in a low-p setting are also PE in a high-p setting, and one cannot sign the change, with respect to p, in the chosen effort level (i.e., in the chosen PE)—it could be positive, nil, or negative.

Consider the interval that changes with respect to p, PE_M. Its length is

$$\begin{aligned} l_{PE_M} &= e^M_{max} - e^M_{min} \\ &= c'^{-1}\left[\frac{r}{1+\eta}(1 + q\eta + (p+r)\eta\lambda)w\right] - c'^{-1}\left[\frac{r}{1+\eta\lambda}(1 + (q+r)\eta + p\eta\lambda)w\right]. \end{aligned}$$

Approximating c'^{-1} as a linear function in the relevant range and taking a lower bound of the length (with $p = 0$, $r = 0$),

$$\begin{aligned} l_{PE_M} &\cong c'^{-1}\left[rw\left(\frac{1 + q\eta + (p+r)\eta\lambda}{1+\eta} - \frac{1 + (q+r)\eta + p\eta\lambda}{1+\eta\lambda}\right)\right] \\ &\geq c'^{-1}\left[rw\left(\frac{\eta(\lambda - 1)}{1+\eta\lambda}\right)\right]. \end{aligned}$$

Now taking the upper bound for the change of e^M_{min} when changing p,

$$\begin{aligned}\Delta e^M_{min} &\leq e^M_{min}\,(p = 1 - r) - e^M_{min}(p = 0)\\ &= c'^{-1}\left[\frac{r}{1 + \eta\lambda}(1 + r\eta + (1 - r)\eta\lambda)w\right] - c'^{-1}\left[\frac{r}{1 + \eta\lambda}(1 + \eta)w\right]\\ &\cong c'^{-1}\left[rw\left(\frac{\eta(1 - r)(\lambda - 1)}{1 + \eta\lambda}\right)\right].\end{aligned}$$

Thus, even in this extreme case,

$$\Delta e^M_{min} \lesssim l_{PE_M},$$

and the PE_M intervals in the two settings overlap. Simulations that use reasonable parameter values show that this overlap is large and covers most of the intervals in both settings, making it impossible to sign $\left(\frac{\partial e_{PE}}{\partial p}\right)_r$ without specifying an equilibrium-selection refinement.

F.3 Notes

- Interestingly, the PE interval is only limited by L and H but not affected by them directly. For example, an appropriate setting of L and H is important in order to enable PE inside the effort interval $L \leq we \leq H$, but once enabled, the PE interval's length is not affected by L and H.

- Gain-loss utility in the effort dimension does not play a major role in this setting. If it is not considered (as in GGSZ), then the only change is in the coefficients of $c(e)$ and $c(e')$, from $\frac{1+\eta}{r}$ and $\frac{1+\eta\lambda}{r}$ to $\frac{1}{r}$.

- If effort is weighted more than earnings in the utility function—because effort is consumed at present while earnings support future consumption, and the future is discounted (see, e.g., KR 2009)—then $c(e)$ is multiplied by a constant. This does not change its crucial properties, and the analysis remains the same.

- GGSZ suggest another possible equilibrium consideration:

  $$\underline{e} = \underset{e}{argmin}[U(F(e)|F(e)) \geq U(F(e')|F(e))\ \forall e' > e]$$

  Finding this similar-to-PPE equilibrium requires only part of the conditions analyzed above, and the conclusion $\left(\frac{\partial \underline{e}}{\partial p}\right)_r \geq 0$ remains valid. This equilibrium seems appropriate for a person who can take as reference only her current position, and is satisfied when no extra effort can improve her utility relative to this reference.

- A parallel approach can be comparing the current position to the previous ones, being satisfied at the last point that is an improvement compared to them. This approach yields

  $$\overline{e} = \underset{e}{argmax}[U(F(e)|F(e)) \geq U(F(e')|F(e))\ \forall e' < e],$$

  and the equilibrium maintains the conclusion $\left(\frac{\partial \overline{e}}{\partial p}\right)_r \geq 0$.

F.4 An Alternative Graphical Approach

F.4.1 PE Interval Construction

Recall the credibility (PE) condition for a given effort level e:

$$\forall e' : U(F(e)|F(e)) \geq U(F(e')|F(e)).$$

The utility function $U(F(e')|F(e)) \equiv U_e(e')$ is, after removing constant terms and dividing by r,

$$U_e(e') = we' + p\,\mu(we' - H) + q\,\mu(we' - L) + r\,\mu(we' - we) - \frac{c(e')}{r} + \frac{\mu(c(e) - c(e'))}{r}.$$

We separate it into a benefit term B and a cost term C

$$\mathrm{B}_e(e') = we' + p\,\mu(we' - H) + q\,\mu(we' - L) + r\,\mu(we' - we)$$

$$\mathrm{C}_e(e') = \frac{c(e')}{r} - \frac{\mu(c(e) - c(e'))}{r},$$

and analyze their marginals

$$\mathrm{MB}_e(e') = w\left(1 + p\eta\lambda_{H/w}(e') + q\eta\lambda_{L/w}(e') + r\eta\lambda_e(e')\right)$$

$$\mathrm{MC}_e(e') = \frac{1}{r}\left(1 + \eta\lambda_{e'}(e)\right)c'(e'),$$

where $\lambda_y(x) \equiv \begin{cases} \lambda & x \leq y \\ 1 & x > y \end{cases}$. Using these notations, a planned effort level e is credible if it is an optimal point of the function $U_e(\cdot)$. Under the assumption of increasing marginal cost of effort, e is credible if the MB and MC curves intersect at e.[8] Figure F.10 demonstrates a situation with a credible effort level in the range $L \leq we \leq H$. Since the MB, MC functions are discontinuous at e, a range of credible effort levels is possible, which we want to find. To find the maximal credible effort, note that if e is increased from its level in figure F.10, MC has greater values at both sides of e while MB maintains the same values. This makes the intersection of MB and MC at e less likely. Thus, the highest e value that ensures MB and MC intersection at e is obtained when the lower branch of MC intersects with the second-highest branch of MB:

$$w\beta_2 = ac'(e_{max}),$$

where $w\beta_2$ is the marginal benefit at that branch of MB and $a = \frac{1}{r}(1 + \eta)$. Therefore the maximal credible effort is

$$e_{max} = c'^{-1}\left(\frac{w\beta_2}{a}\right). \tag{F.8}$$

[8]Formally, the MB and MC curves are not defined at e and optimality of $U_e(\cdot)$ is achieved at e if MB > MC for all $e' < e$ and MB < MC for all $e' > e$. To keep things simple and intuitive we use the term "intersection at e" to describe this situation.

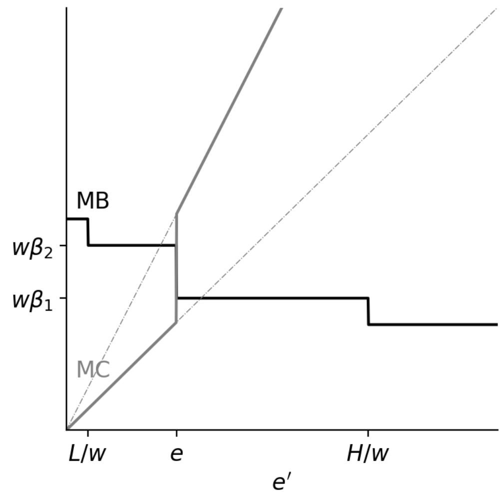


Figure F.10: Intersection of the MB and MC curves of the utility function $U_e(e')$ at e, indicating that e is a credible effort level. Solid black line: MB curve. Solid gray line: MC curve. Dashed gray lines are added to indicate the two rays that the MC curve equals to on both sides of the reference point e. Here $L = 1$, $H = 14$.

If this effort level is in the range $L \le we \le H$, as in figure F.10, $\beta_2 = 1 + q\eta + (p + r)\eta\lambda$. Similarly, the minimal credible effort is

$$e_{min} = c'^{-1}\left(\frac{w\beta_1}{b}\right), \tag{F.9}$$

with $w\beta_1$ the marginal benefit at the second-lowest branch of MB and $b = \frac{1}{r}(1 + \eta\lambda)$. If this effort level is in the range $L \le we \le H$, as in figure F.10, $\beta_1 = 1 + (q + r)\eta + p\eta\lambda$. Since MB and MC do not intersect at e for $e < e_{min}$ or for $e > e_{max}$, but do intersect at e for all $e_{min} \le e \le e_{max}$, the set of credible effort levels is the closed interval

$$\text{PE} = [e_{min}, e_{max}].$$

This is demnostrated in figure F.11.

We can now apply this logic to the general case where the credible effort levels are not neccessarily between L/w and H/w. The complete credible effort level set is a closed interval, which is constructed using the following steps:

1. For each inteval $I_i = [S_{1,i}, S_{2,i}] \in \{[0, L], [L, H], [H, \infty)\}$ (ordered from the lowest to the highest):
   (a) Calculate $e_{min,i}$ and $e_{max,i}$ using eq. F.8, F.9, where $w\beta_2$ and $w\beta_1$ are the marginal benefit levels to the left and the right of the discontinuity at e respectively, and a , b are as defined above. For example, in the interval $I = [0, L]$: $\beta_1 = 1{+}r\eta{+}(p{+}q)\eta\lambda$, $\beta_2 = 1 + \eta\lambda$.

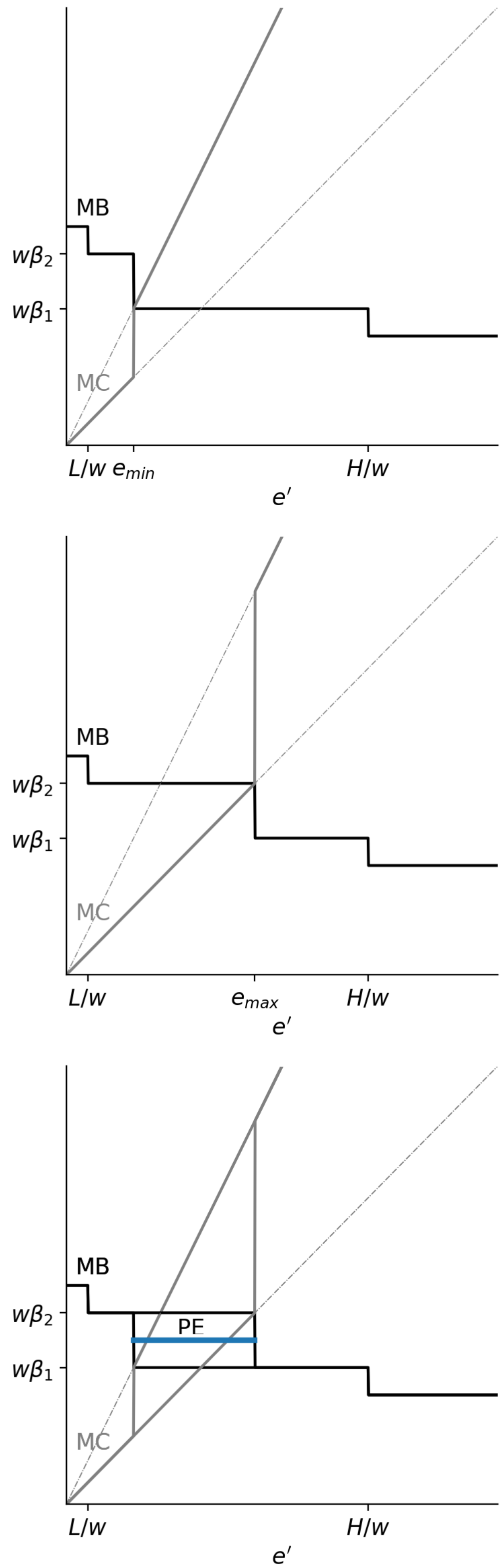


Figure F.11: Construction of the PE interval. Upper panel: determination of e_{min}. Middle panel: determination of e_{max}. Lower panel: combination of the upper and middle panels, yielding the complete interval.

(b) Form the interval of credible effort levels in I_i:

$$\mathrm{PE}_i = [e_{min,i}, e_{max,i}] \cap I_i.$$

Note that $\mathrm{PE}_i = \varnothing$ is possible.

(c) If $e_{max} < S_{1,i+1}$, the process can be stopped, because a gap between subsequent intervals PE_i, PE_{i+1} is not possible since the total PE set is a closed interval.

2. The total PE interval is

$$\mathrm{PE} = \bigcup_i \mathrm{PE}_i.$$

This process can be easily generalized to other scenarios of a lottery between diffrent fixed payments and an acquired earnings payment. Having the PE interval, we consider two options for the final effort choice by a subject: a choice of an arbitrary effort level e_{PE} inside the interval, which is by definition not uniquely defined, or a specific choice of the effort level that maximizes $U_e(e)$ inside the interval, e_{PPE}.

F.4.2 Signing $\left(\frac{\partial e_{\mathbf{PE}}}{\partial p}\right)_r$

We examine first how the PE interval's boundaries change with respect to p. Looking back at eq. F.8, F.9 and recalling that $c'^{-1}(\cdot)$ is increasing, the question reduces to the sign of $\left(\frac{\partial \beta_j}{\partial p}\right)_r$, $j = 1, 2$. Since increasing p decreases q in the same magnitude while maintaining r constant, the derivative is non-zero only if p and q appear in different terms in the β parameter. This is true only for we_{min}, we_{max} inside the $[L, H]$ interval, and can be conveyed graphically by the fact that altering p and q does not affect the MB curve outside this interval (this can be seen in figure F.12). Using the β values calculated above, for both $j = 1, 2$

$$\left(\frac{\partial \beta_j}{\partial p}\right)_r > 0.$$

Therefore, a PE set with at least one bound inside the interval $[L, H]$ will move forward when p is increased, as this bound will increase. A PE set with both bounds outside $[L, H]$ will remain the same regardless of p. Thus, many scenarios of a choice change between different p treatments are possible. It can be shown that with reasonable parameter values, a PE interval whose both bounds increase with p has a weak forward movement relative to its length, rendering the sign of $\left(\frac{\partial e_{\mathrm{PE}}}{\partial p}\right)_r$ ambiguous. Figure F.12 demonstrates this, as it shows the extreme case of a change from $p = 0$ to $p = 0.5$.

F.4.3 Signing $\left(\frac{\partial e_{\mathbf{PPE}}}{\partial p}\right)_r$

A PPE choice is identical to the CPE choice analyzed in GGSZ if the CPE is inside the PE interval. Otherwise, since the function $U_e(e)$ has a single peak, a corner solution is chosen, namely, the effort with the closest utility to that CPE: $e_{\mathrm{PPE}} = e_{min}$ or $e_{\mathrm{PPE}} = e_{max}$. Using the results from the previous section regarding $\left(\frac{\partial e_{min}}{\partial p}\right)_r$, $\left(\frac{\partial e_{max}}{\partial p}\right)_r$, we obatin a similar result

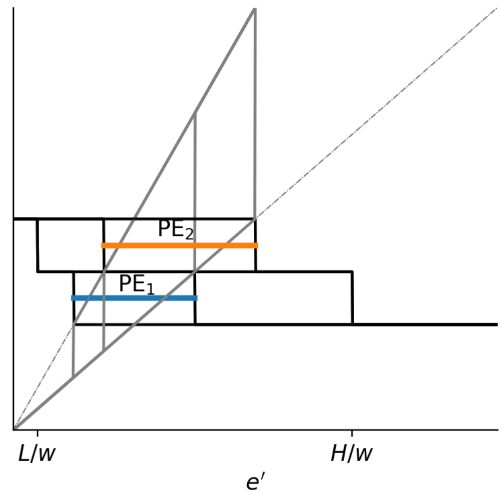


Figure F.12: Two drawings of the lower panel of figure F.11 for $p = 0$ (blue) and $p = 0.5$ (orange), showing that a PE interval that is contained in $[L/w, H/w]$ moves forward with p.

to GGSZ's:

$$\begin{cases} \left(\frac{\partial e_{\text{PPE}}}{\partial p}\right)_r = 0 & we < L \\ \left(\frac{\partial e_{\text{PPE}}}{\partial p}\right)_r > 0 & L \leq we \leq H \\ \left(\frac{\partial e_{\text{PPE}}}{\partial p}\right)_r = 0 & H < we \end{cases} .$$

Appendix G: Studies 1 & 2 Prob. Demonst. Questions

Figures A.1 and A.2 present, by eight experimental cells, the means and 95% confidence intervals, and the entire distribution, of responses to the six A–K questions on the Probability Demonstration page. Recall, in these questions participants choose words ranging from "No chance at all" (by marking "A," coded in the figures as 1) to "Completely certain" (by marking "K," coded as 11) for expressing their "subjective feelings regarding probabilities." As a simple manipulation check, figure A.1 also presents data on the fraction of squares that participants colored in blue. Mean fraction is 0.16–0.19 in the four 1-in-6 cells, and 0.49–0.56 in the four 50-50 cells, suggesting that subjects toss a fair die, understand the coloring task and, importantly, strongly respond (by this simple sanity-check measure) to Demonstration condition assignment.

While subjects react as expected to Demonstration condition in terms of blue squares, and while, as we discuss shortly, they also react as expected to coin-flip assignment, the two figures show that Demonstration condition has essentially no effect on responses to the six A–K questions. In the rest of this appendix we discuss these responses.

Responses to the first two questions—"What is the chance that the outcome of the die will be 4?" and "… will not be 4?" vary little across experimental conditions: in all eight cells their mode and median is 4 ("Low chance") and 9 ("Very high chance"), respectively, in the two questions. (In each of the 16 question-cells, roughly 40–70% of respondents give the modal response; mean responses in all cells are slightly above 4 and slightly below 8, respectively, in the two questions.) Interestingly, the modal/median respondent does not use fully symmetric language to express her feelings about the probabilities of the two complementary events "4" and "not 4": while "4" has a "Low chance" (rather than, e.g., a "Very low chance"), "not 4" has a "Very high chance" (rather than, e.g., a "High chance").

Expressing their feelings in the next two questions—"If I choose "Keep," what is the chance that I will take home the bottle?" and "… the chocolate?"—the modal respondent expresses no doubt by choosing from the scale's extremes 1 ("No chance at all") and 11 ("Completely certain") according to whether they are coin-bottle or coin-chocolate respondents. (In each of the 16 question-cells, 60–80% of respondents give the modal response; the means are slightly removed from the 1 and 11 extremes.)

Finally, responses to the last two questions—"If I choose "Exchange," what is the chance that I will take home the bottle?" and "... the chocolate?"—show flatter distributions that we did not expect. While 4 and 9 remain common responses in a way that is consistent with response patterns in the first two questions, 1 and 11 are unexpectedly common too—indeed, in most question-cells the mode is now 1 or 11—in a way that suggests that some respondents feel that a choice to exchange the item would be applied with certainty—just like a choice to keep the item.

We first noticed this often-bimodal distribution after completing 13 of our planned 19 lab sessions (covering 188 subjects, or 70% of the total). We first hypothesized that while most respondents understood the experimental procedures and formed expectations as intended by the experiment—as evidenced by the comprehension quiz questions—a sizable fraction of them might have assumed, incorrectly, that they were going to be asked whether they wanted to keep or exchange their item only *after* the realization of the die roll, i.e., when uncertainty no longer remained. To explore this hypothesis, we designed an additional, one-page exit survey to be given to participants after they completed the experiment. We handed it to all participants who completed the last page of the (original) instructions, as long as others in their session were not yet finished.[9] In the next three sessions we collected 37 responses to our new exit survey. They did not support our hypothesis: almost all subjects reported that they had in fact understood correctly the experimental procedures early on in the experiment. We next hypothesized that it was the two questions on page 4—"If I choose "Exchange,"

[9]This guaranteed that we were giving the extra page only to participants who were waiting in their seats anyway, in turn guaranteeing that the original length of sessions did not change. Therefore, from each participant's point of view, nothing has changed in the experiment—including recruiting materials, session length, etc.—until the very last few minutes in the lab, between completing the experiment and being paid and leaving.

what is the chance that I will take home the bottle?" and "... the chocolate?"—that were misunderstood by respondents. To explore this new hypothesis, in the last three sessions we added additional questions to the exit survey, which was handed to another 37 subjects. We cannot draw strong conclusions from these post-experiment explorations, conducted on small and non-random subsamples of our subjects. That said, our reading of the exit responses suggests that at least some of the unexpected responses to the last two questions on page 4 resulted from a misunderstanding of the two questions themselves, and should not have affected subjects' behavior in the rest of the experiment.

We take two steps to address remaining doubts. First, as noted in the last paragraph of our main results section (section 2.5 in the paper), we reproduce an appendix version (table A.2) of our main-results table (table 1) that excludes subjects with an extreme answer of 1 or 11 ("No chance at all" or "Completely certain") in the last two questions on page 4. As we report there, results move around but remain generally similar; statistical significance drops with sample size. Second, as noted in the last paragraph of section 2.4, we conduct a second experiment, Study 2, as a replication of Study 1's 1-in-6 Demo condition. The main difference between the two studies is that we rearrange the six A–K questions on p. 4 in a way that is meant to streamline flow and improve readability. Figures A.3 and A.4 present the means and distributions of responses to the rearranged six A–K questions in Study 2. Reassuringly, while response distributions in the first four questions are essentially the same as in Study 1 (the means are indistinguishable across the studies), response distributions in the last two questions are considerably more consistent with those in the first two questions than the corresponding questions are in Study 1. In particular, in Study 2 the responses 4 ("Low chance") and 9 ("Very high chance") are modal responses in all eight question-cells (with 35-45% of respondents giving the modal answer in most cells). Finally, mean responses to all six questions are within a reasonable range of what one would expect.

Table A.1: Choice by Experimental Condition (Only Subjects Correct on 1st Attempt)

	Weak Expectations	Strong Expectations	Weak Expectations	Strong Expectations
A. New Experimental Treatments	50-50 Demonstration		1-in-6 Demonstration	
Study 1 (N = 246)	q = 5/6	q = 1/6	q = 5/6	q = 1/6
(# coin-bottle, # coin-chocolate)	(27, 29)	(41, 22)	(26, 39)	(34, 28)
(% choosing bottle, % choosing bottle)	(74%, 52%) d = 22% p = 0.08	(61%, 68%) d = −7% p = 0.57	(58%, 62%) d = −4% p = 0.76	(71%, 57%) d = 13% p = 0.27
Study 2 (N = 196)			q = 5/6	q = 1/6
(# coin-bottle, # coin-chocolate)			(52, 44)	(53, 47)
(% choosing bottle, % choosing bottle)			(56%, 48%) d = 8% p = 0.43	(58%, 43%) d = 16% p = 0.11
B. Treatments in Heffetz & List (2014) (HL)	No Probability Demonst.			
HL Study 2 (N = 98, More Endowment)	q = 9/10	q = 1/10		
(# coin-mug, # coin-pen)	(21, 25)	(23, 29)		
(% choosing mug, % choosing mug)	(71%, 48%) d = 23% p = 0.11	(70%, 52%) d = 18% p = 0.19		
HL Study 3 (N = 107)	q = 9/10	q = 1/10		
(# coin-mug, # coin-pen)	(29, 28)	(23, 27)		
(% choosing mug, % choosing mug)	(62%, 57%) d = 5% p = 0.70	(52%, 70%) d = −18% p = 0.19		
C. Pooling All Treatments from A + B	50-50 or No Demonst.		1-in-6 Demonstration	
(N = 647)	(77, 82)	(87, 78)	(78, 83)	(87, 75)
	(69%, 52%) d = 16% p = 0.03	(61%, 63%) d = −2% p = 0.80	(56%, 54%) d = 2% p = 0.78	(63%, 48%) d = 15% p = 0.05

Notes: Percentages are rounded to the nearest whole number. All p-values are from two-sample two-sided tests of equality of proportions. Results in panel B are reproduced from Heffetz and List (2014, online appendix, tables A2 and A3).

Table A.2: Choice by Experimental Condition (Only Subjects with No "Extreme" Response)

	Weak Expectations	Strong Expectations	Weak Expectations	Strong Expectations
A. New Experimental Treatments	50-50 Demonstration		1-in-6 Demonstration	
Study 1 (N = 168)	q = 5/6	q = 1/6	q = 5/6	q = 1/6
(# coin-bottle, # coin-chocolate)	(23, 21)	(30, 12)	(18, 22)	(22, 20)
(% choosing bottle, % choosing bottle)	(65%, 48%) d = 18% p = 0.24	(53%, 50%) d = 3% p = 0.85	(44%, 55%) d = −10% p = 0.53	(73%, 60%) d = 13% p = 0.38
Study 2 (N = 172)			q = 5/6	q = 1/6
(# coin-bottle, # coin-chocolate)			(43, 41)	(45, 43)
(% choosing bottle, % choosing bottle)			(56%, 54%) d = 2% p = 0.84	(62%, 42%) d = 20% p = 0.06
B. Treatments in Heffetz & List (2014) (HL)	No Probability Demonst.			
HL Study 2 (N = 117, More Endowment)	q = 9/10	q = 1/10		
(# coin-mug, # coin-pen)	(32, 26)	(25, 34)		
(% choosing mug, % choosing mug)	(81%, 50%) d = 31% p = 0.01	(64%, 53%) d = 11% p = 0.40		
HL Study 3 (N = 225)	q = 9/10	q = 1/10		
(# coin-mug, # coin-pen)	(56, 61)	(44, 64)		
(% choosing mug, % choosing mug)	(70%, 54%) d = 16% p = 0.08	(61%, 53%) d = 8% p = 0.40		
C. Pooling All Treatments from A + B	50-50 or No Demonst.		1-in-6 Demonstration	
(N = 682)	(111, 108)	(99, 110)	(61, 63)	(67, 63)
	(72%, 52%) d = 20% p = 0.002	(60%, 53%) d = 6% p = 0.32	(52%, 54%) d = −2% p = 0.87	(66%, 48%) d = 18% p = 0.04

Notes: Percentages are rounded to the nearest whole number. All p-values are from two-sample two-sided tests of equality of proportions. Results in panel B are reproduced from Heffetz and List (2014, tables 2 and 3).

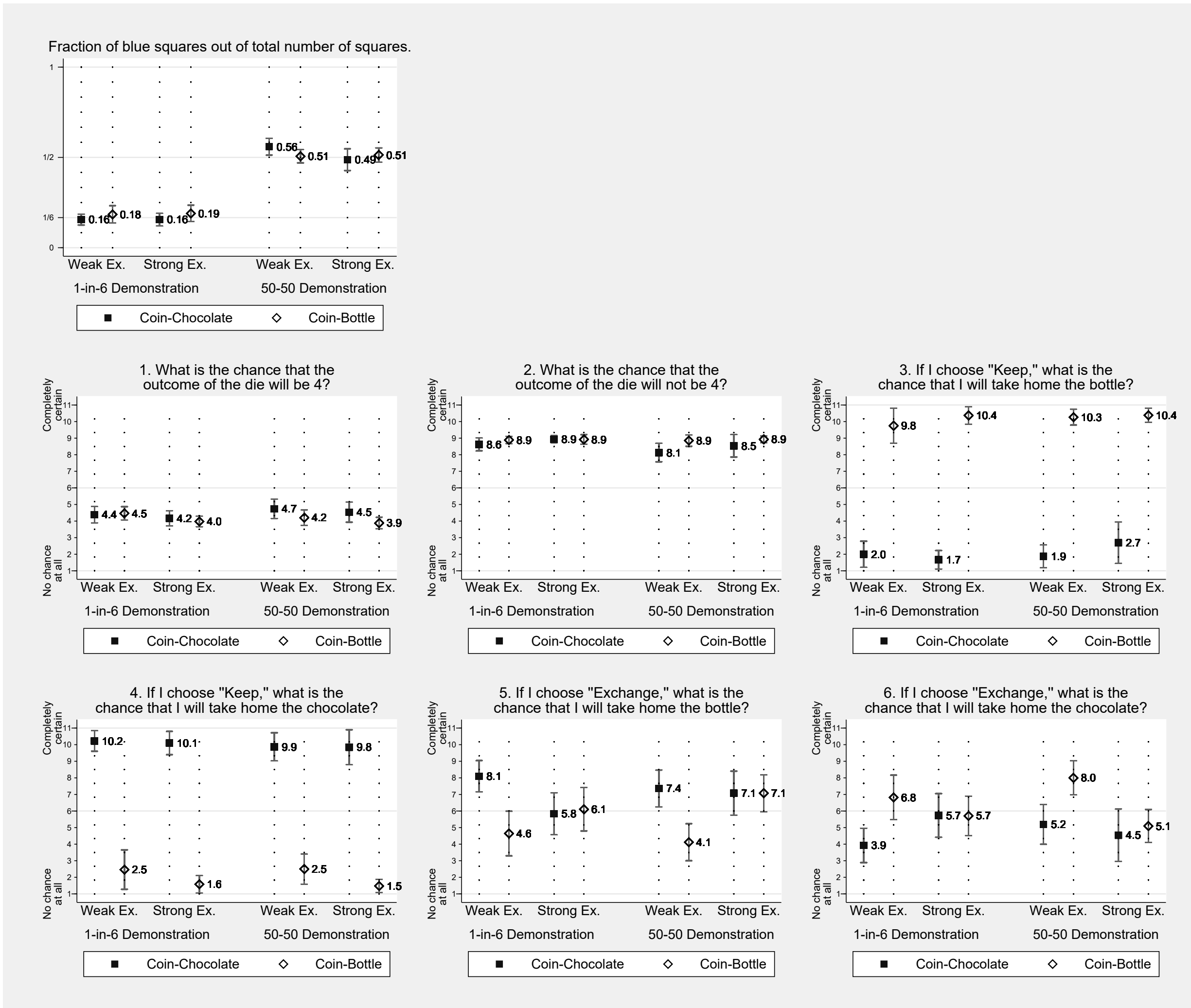
Table A.3: Effort by Experimental Condition (All $0 < p < \frac{1}{2}, H = \$14, L = \$0$ Treatments)

		Low Exp.	High Exp.	Low Exp.	High Exp.	Low Exp.	High Exp.
A. New Experiments		Study 3: No Coin				Study 4: Coin	
		50-50 Demonst.		1-in-6 Demonstration			
	p	1/12	5/12	1/12	5/12	1/12	5/12
	N	31	31	31	34	60	60
Work Time	mean	26.5	27.9	25.6	23.6	21.6	26.1
	[med]	[23.1]	[22.7]	[21.4]	[22.2]	[18.7]	[26.6]
	(S.D.)	(15.3)	(14.4)	(15.4)	(16.7)	(15.1)	(16.4)
		$d = 1.4$		$d = -1.9$		$d = 4.4$	
		$p = 0.70$		$p = 0.63$		$p = 0.13$	
		$d^c = 2.4$		$d^c = -2.6$		$d^c = 4.3$	
		$p^c = 0.53$		$p^c = 0.51$		$p^c = 0.14$	

B. Gneezy et al. (2017)		No Prob. Demo.		
	p	1/8	2/8	3/8
	N	30	29	29
Work Time	mean	30.7	22.1	36.8
	[med]	[24.2]	[19.4]	[39.5]
	(S.D.)	(17.3)	(14.0)	(20.4)
	$d =$	-8.6	14.7	
	$p =$	0.04	0.002	
		$d = 6.1$		
		$p = 0.22$		

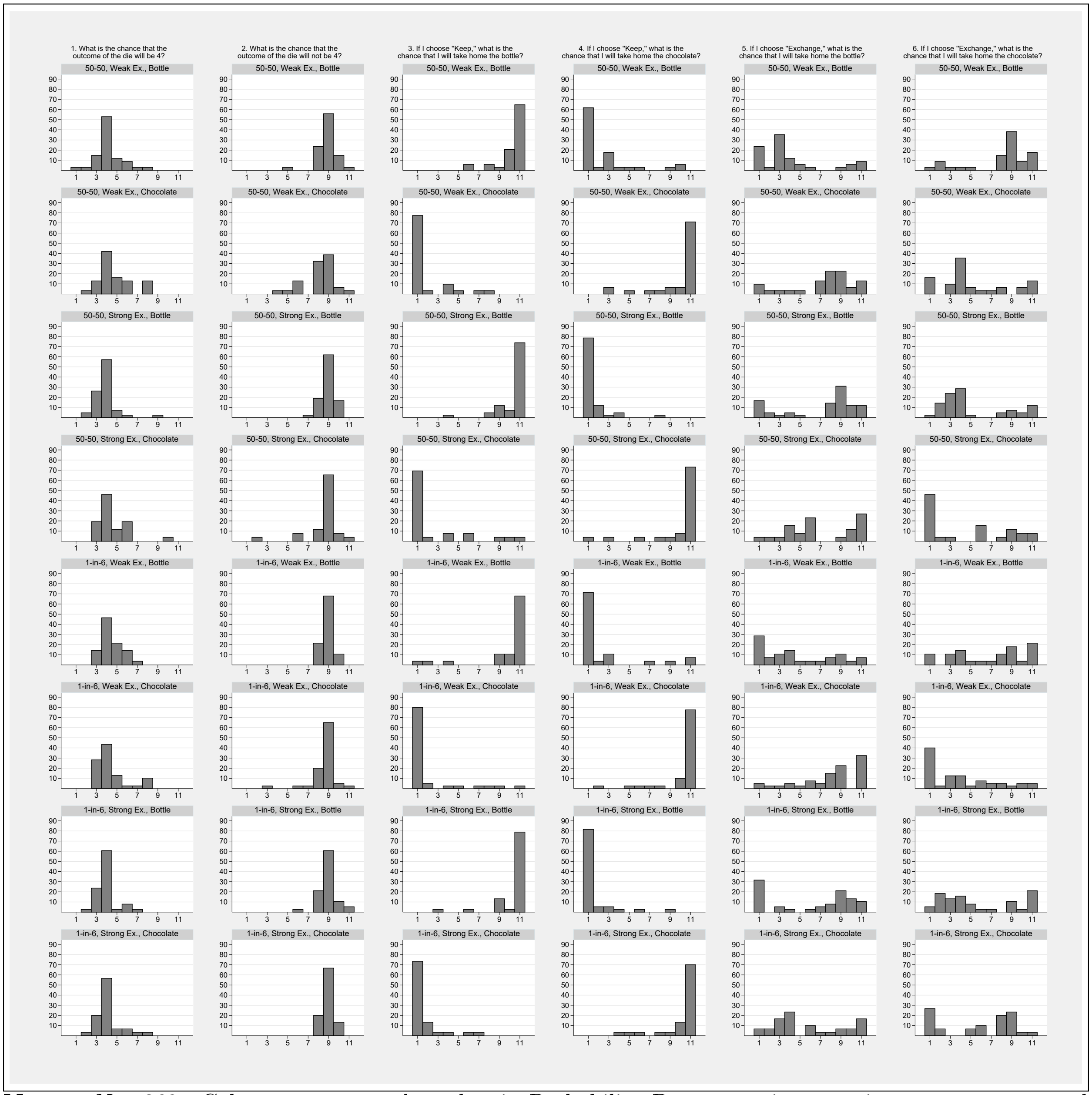
Notes: Work time: in minutes. Differences and p-values: OLS regressions on a treatment indicator (and a constant), without additional controls (d, p) and with the following controls (d^c, p^c): productivity (in the experiment's first part), time of the day, and indicators for weekend/break and male. Each regression includes observations from a pair of treatments. Results in panel B are reproduced from Gneezy et al. (2017, table 1) or calculated from a data package provided by the authors.

Figure A.1: Probability Demonstration Questions, Mean Responses, Study 1



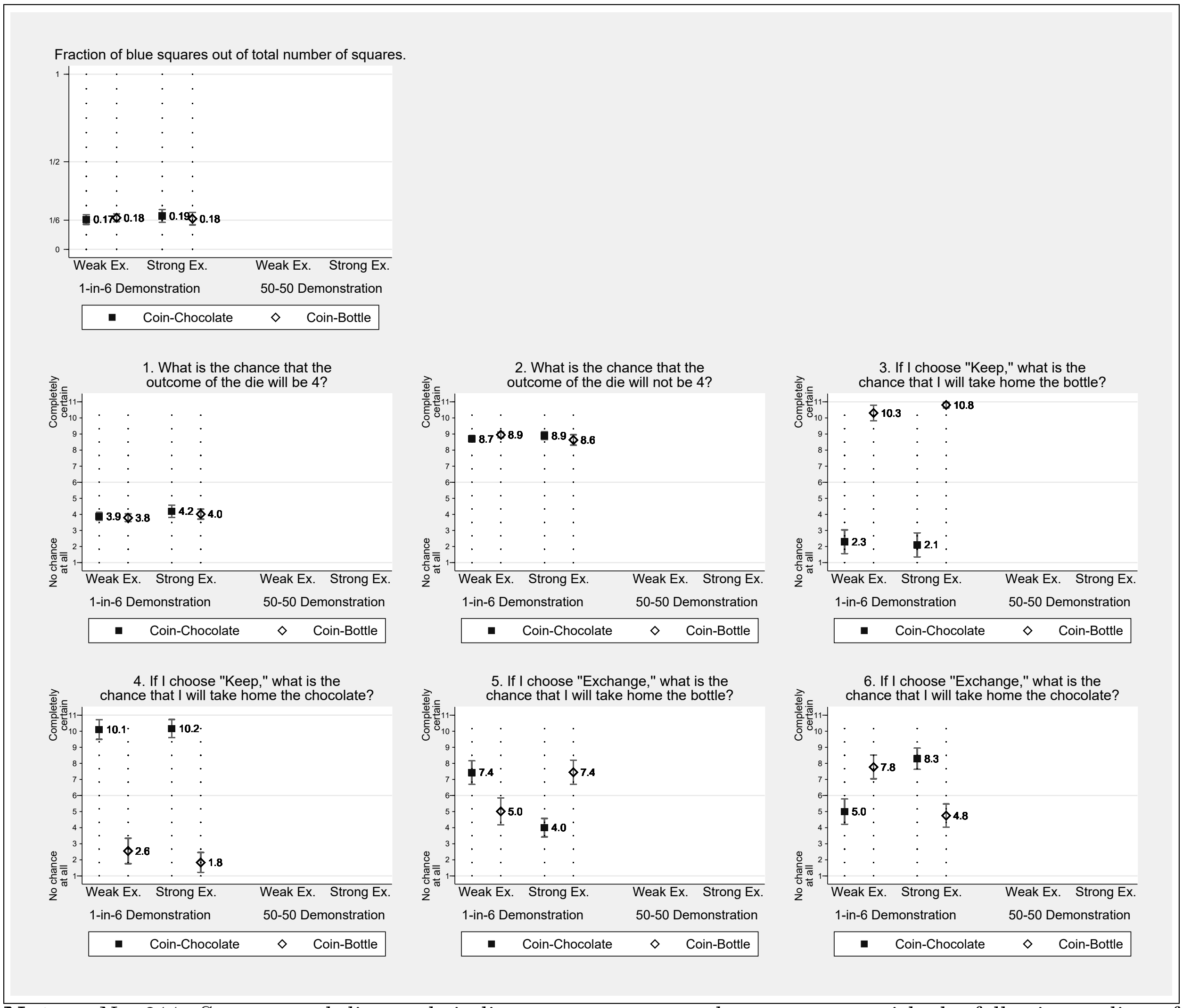
Notes: $N = 269$. Squares and diamonds indicate mean response by treatment, with the following coding of responses in questions 1–6: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain. Capped ranges indicate 95% confidence intervals.

Figure A.2: Probability Demonstration Questions, Distribution of Responses, Study 1



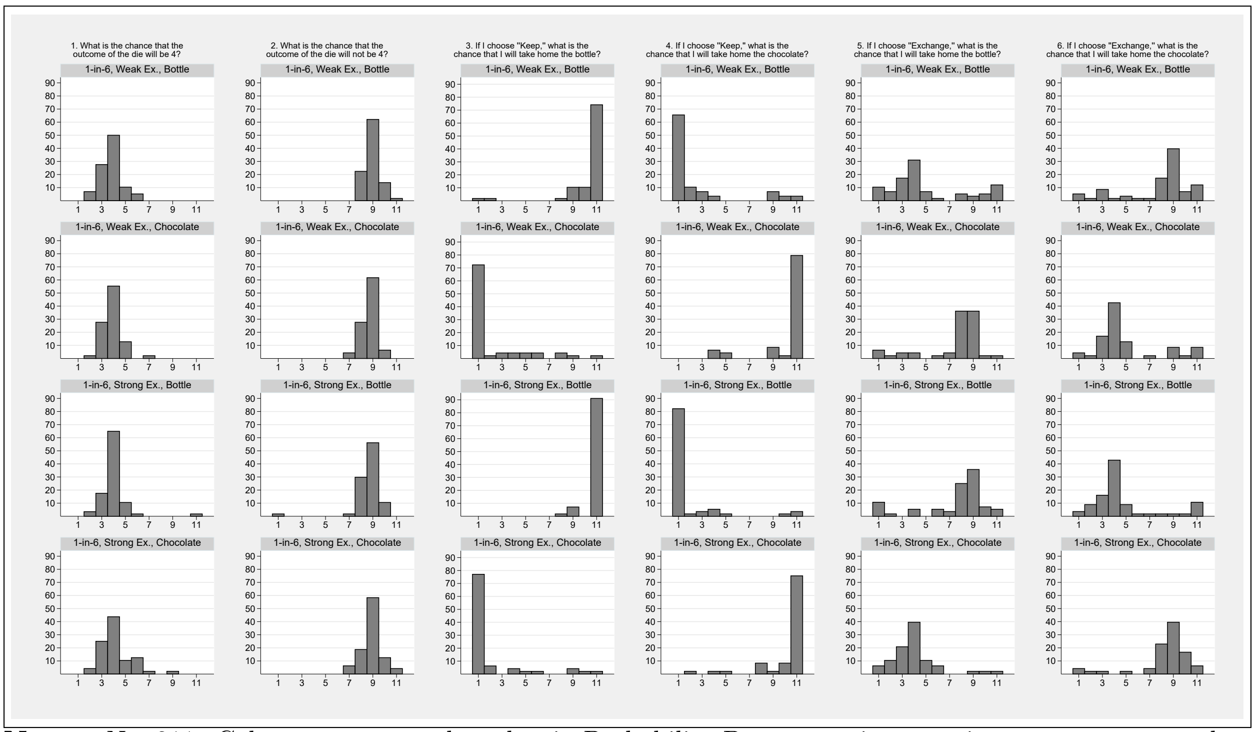
Notes: N = 269. Columns correspond to the six Probability Demonstration questions; rows correspond to the $2 \times 2 \times 2$ treatments. Vertical axis: percent of subjects. Horizontal axis responses are coded as follows: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain.

Figure A.3: Probability Demonstration Questions, Mean Responses, Study 2



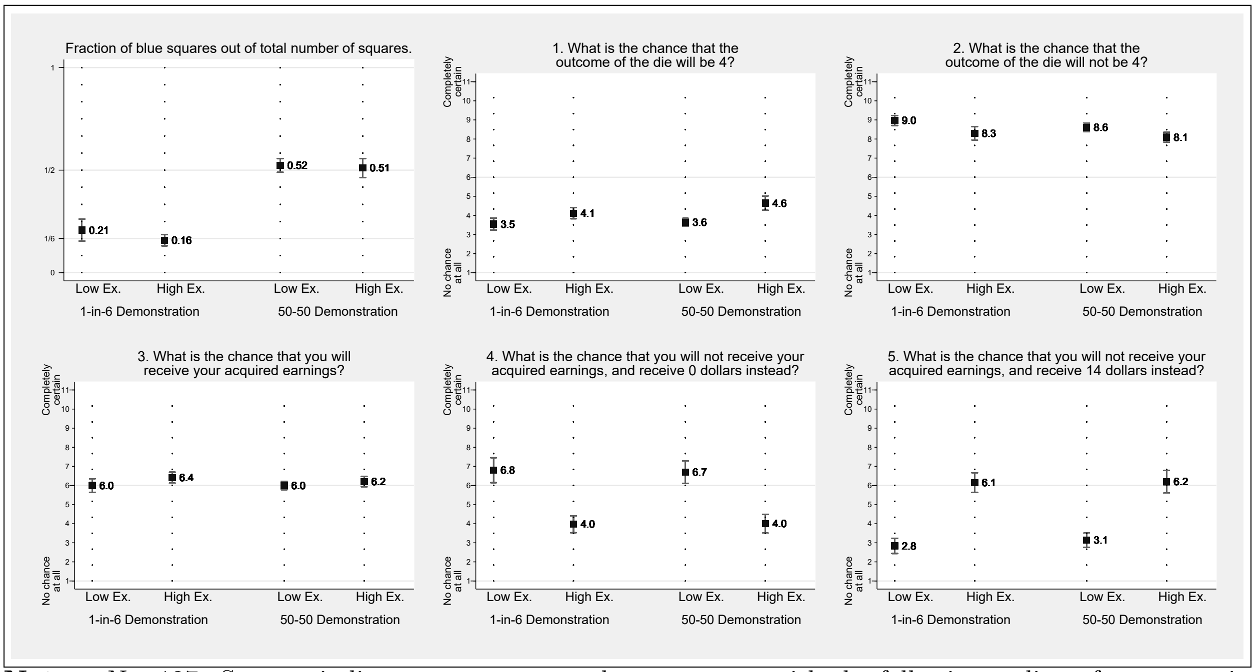
Notes: $N = 211$. Squares and diamonds indicate mean response by treatment, with the following coding of responses in questions 1–6: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain. Capped ranges indicate 95% confidence intervals.

Figure A.4: Probability Demonstration Questions, Distribution of Responses, Study 2



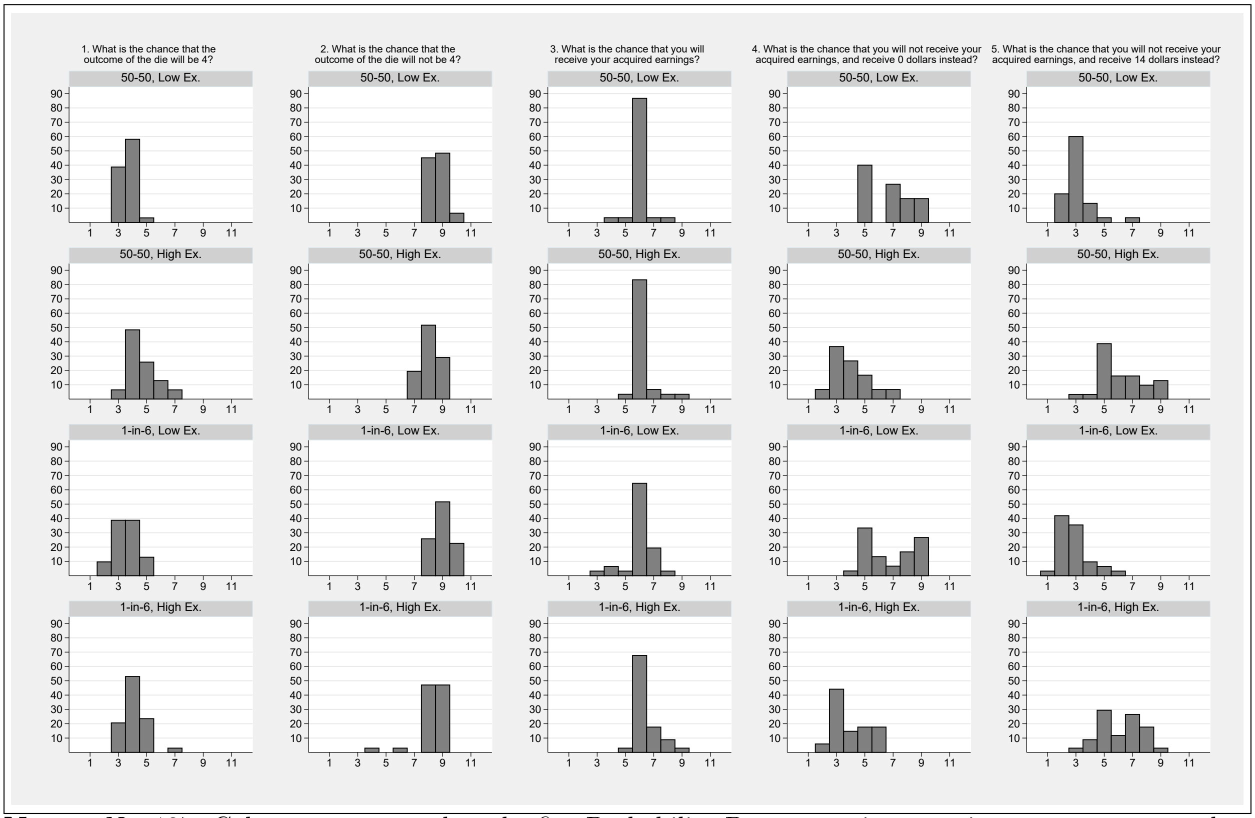
Notes: N = 211. Columns correspond to the six Probability Demonstration questions; rows correspond to the 2×2 treatments. Vertical axis: percent of subjects. Horizontal axis responses are coded as follows: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain.

Figure A.5: Probability Demonstration Questions, Mean Responses, Study 3



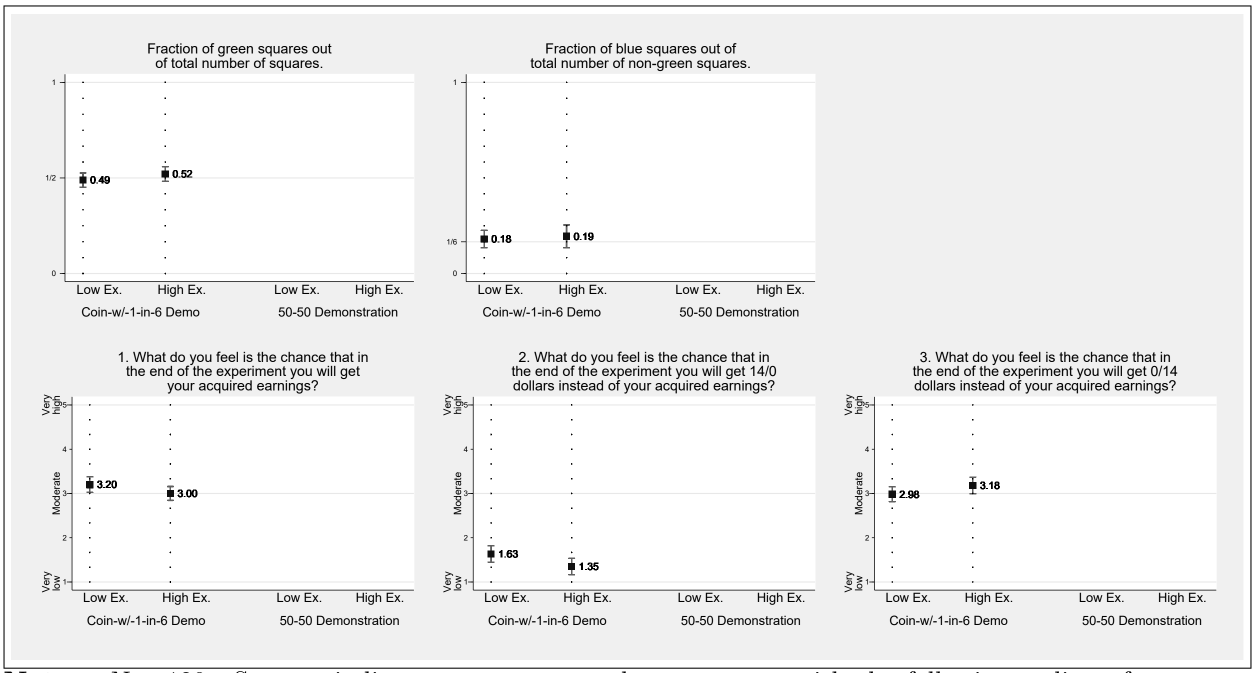
Notes: N = 127. Squares indicate mean response by treatment, with the following coding of responses in questions 1–5: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain. Capped ranges indicate 95% confidence intervals.

Figure A.6: Probability Demonstration Questions, Distribution of Responses, Study 3



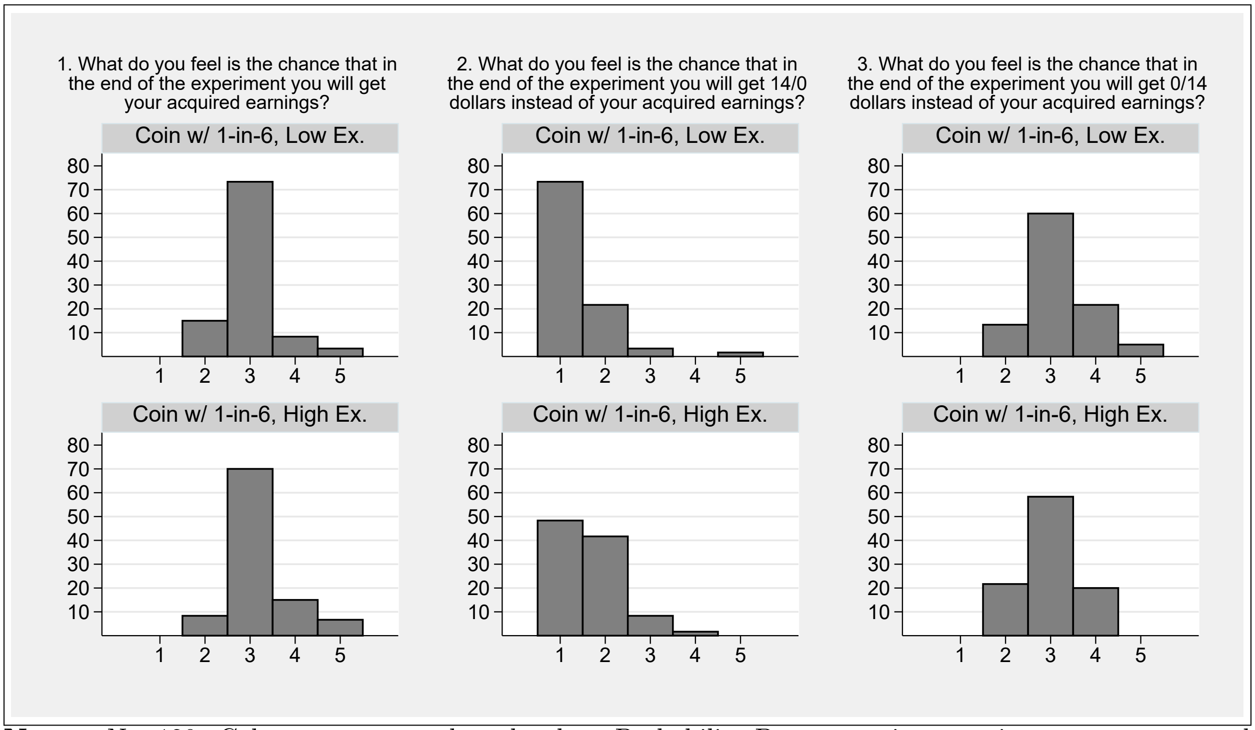
Notes: N = 127. Columns correspond to the five Probability Demonstration questions; rows correspond to the 2×2 treatments. Vertical axis: percent of subjects. Horizontal axis responses are coded as follows: 1=No chance at all, 2=Nearly no chance, 3=Very low chance, 4=Low chance, 5=Slightly low chance, 6=Neither high nor low chance, 7=Slightly high chance, 8=High chance, 9=Very high chance, 10=Nearly certain, 11=Completely certain.

Figure A.7: Probability Demonstration Questions, Mean Responses, Study 4



Notes: N = 120. Squares indicate mean response by treatment, with the following coding of responses in questions 1–3: 1=very low, 2=low, 3=moderate, 4=high, 5=very high. Capped ranges indicate 95% confidence intervals.

Figure A.8: Probability Demonstration Questions, Distribution of Responses, Study 4



Notes: N = 120. Columns correspond to the three Probability Demonstration questions; rows correspond to the two treatments. Vertical axis: percent of subjects. Horizontal axis responses are coded as follows: 1=very low, 2=low, 3=moderate, 4=high, 5=very high.