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The Alleviation of Free-Riding: A Research Program Progress Report

*David J. Hoaas and Lauren J. Madigan**

Introduction

The use of experimental methods within the economics profession is increasing. Recently, the *American Economic Review* [Andreoni, 1995] presented an article highlighting the use of experimental economics in the study of a relatively well known phenomenon, free-riding. The intent of this study is to explore those factors that may improve cooperation in the provision of public goods and reduce free-riding. A number of years ago, Hoaas and Drouillard [1993] conducted several variations of a public goods experiment to examine how changes in participant characteristics, the environment surrounding the experiment, and the institutional structure of the experiment altered the outcomes of the experiment. The results of that research were published in the Spring 1993 edition of *Classroom Expernomics*. This paper is meant to serve as a progress report of further research conducted using this same economic experiment.

Briefly, the experiment used goes as follows. In successive decision-making rounds students are endowed with tokens to invest in either a private account, a group account (public good), or in both accounts. The private account pays a return to the individual for each token he/she invests in each round. The group account pays each individual an equal portion of the total tokens invested in the group account in each round. The private account is considered rival and excludable. The group account is considered nonrival and nonexcludable. The experiment is designed so that the private optimal point is to invest completely in the private account and free-ride on the

group's investment in the public good. The socially optimal point requires 100 percent investment in the group account [Hoaas and Drouillard, p.3].

Experimental Variations and Observations

Following the suggestions of Ledyard [1995, pp. 141-142], several variations of the Hoaas and Drouillard [1993] experiment were conducted to examine how changes in the experimental design could increase participant cooperation in the provision of the public good. Seven separate variations of the experiment were performed in the order described below. In all seven experiments the participants were undergraduates at a liberal arts college. The first group consisted of a well-defined and well-bonded group of participants. The group participants were members of a varsity athletic team taking part in the experiment shortly after the end of their season.

The second group of participants was faced with a forty percent provision point. They were told before the start of the experiment that, in any round, if forty percent of the total tokens were not invested in the group account it would not be available. In any one round, if the total investment in the group account dropped below forty percent, every individual's tokens for that round were converted into an investment in private tokens. The third group was also faced with a provision point. The provision point in the third running of the experiment was a twenty-five percent provision point. The experiment was identical to experiment #2 with this exception.

In the fourth group, the experimenters deceived the participants each round in the reporting of the results. Specifically, each round the investment in the group account was overstated to the participants. In the first round it was overstated by ten percent. In the second round it was overstated by fifteen percent. Each subsequent round added an additional five percent overstatement. In the fourth round, the overstatement was therefore twenty-five percent. It was hypothesized that this overstatement would increase participant cooperation.

In the fifth running of the experiment, the participants were again deceived. In this experiment, the returns or earnings from the group account were systematically understated. Again it was hypothesized

that the investment in the group account would be altered because of the understatement.

In the sixth experiment, the participants were given the opportunity to discuss their investment strategies prior to the start of the experiment. This discussion lasted for five minutes with the experimenters not present in the room while the discussion took place. Once the experiment began, discussion between participants was no longer allowed.

The seventh experiment implemented a unanimity rule. Once the results from a particular round were announced, each participant was given the chance to vote on whether or not the reported investment in and return to the group account were acceptable. The

students voted either yes or no. A single no vote implied that the public or group good was not provided. In the event of one no vote, all investments were converted to an investment in the private account.

The percent of the total tokens invested in the group account per round for each of the seven experiments is shown in the table below. The "Ns" listed in the table represent the rounds when the group account was not provided and all tokens were converted to an investment in the private account.

Casual empiricism shows that in experiment #1 (the well-defined group) initial investment in the group account was over fifty percent in round one. In rounds two and three investment increased further, in round four it was stable, and in the final round it fell. Overall, the participants in this experiment had the second highest overall investment in the group account relative to the other six groups.

In experiment #2 (the 40% provision point) initial investment was high followed by a marked reduction in group investment in round three. The group account was technically not available in round three. In rounds four and five of this experiment, investment in the group account again rose above the forty percent provision point.

In experiment #3 (the 25% provision point) the group investment profile is rather flat. Little variation exists in the pattern of investment in the group account over the five rounds of the experiment. The twenty-five percent provision point was a non-binding constraint in terms of the availability of the group good. In no round did investment in the group account drop below twenty-five percent.

In experiment #4 (overstatement) little additional participant cooperation was seen. Free-riding (low group investment) appears to be present in rounds four and five of the experiment. In experiment #5 (understatement) the results were similar with the exception of one round. As can be seen, in round four of this experiment the lowest level of group cooperation or the highest level of free-riding took place. Specifically, in round four of experiment #5, only 18.5 percent of the total possible investment in the group account took place.

Experiment #6 (pre-experiment discussion) had the highest overall group investment. In this experiment, the five

	ROUNDS				
	1	2	3	4	5
Experiment #1	52	62	62	71	56
Experiment #2	67.5	69	36.5(N)	42.5	48.5
Experiment #3	38	48.5	48.5	50	41.5
Experiment #4	35	47.5	48	29	23
Experiment #5	51	58	54.5	18.5	44
Experiment #6	55.5	70.5	82	73	61
Experiment #7	46(N)	71.5	86.5	62.5(N)	47.5(N)

minutes of discussion appeared to have an impact on the level of group investment. The results of experiment #7 (unanimity) are possibly the most interesting. Though group investment is relatively high in all rounds, particularly rounds two through four, the participants voted three times that the level of group investment was not acceptable.

A Mann-Whitney Test was used to examine the statistical significance of the visual results discussed above (Andreoni 1995 and Conover chapter 5). At the .01 level of significance, the participants in the well-defined group (experiment #1) invested more in the group account than the participants in either the group constrained by a 25% provision point (experiment #3) or the group that consistently had the return to the group account overstated (experiment #4). At the .05 level of significance, the participants in the well-defined group invested more in the group account than did the participants in the group that consistently received an understatement of the returns to the group account (experiment #5).

Investment in experiment #6 (pre-experiment discussion) was also statistically greater than in other versions of the experiment. At the .01 level of significance, the investment in the group account for experiment #6 was greater than the investment in experiment #3 (25% provision point) and experiment #4 (overstatement). At the .05 level of significance, experiment #6 had greater group investment than did experiment #2 (40% provision point) or experiment #5 (understatement).

Though it appears that investment in experiment #6 exceeds investment in experiment #1, this difference is statistically insignificant. The results from experiment #4 show some tendency for over-statement

of group returns to be the least effective means of increasing group investment. The investment in the group account for experiment #4 was statistically less than the investment in the group account for experiments #1, #3, #6, and #7.

A written exit interview was used to question the participants on their investment strategy during the experiments. Explanations of investment strategies were grouped according to four categories (chosen by the authors). The most common strategy was the belief that an individual's return from group investment was more than an individual's return from private investment; individuals weighed the return per token from the group investment against the return per token from the private investment. The second most commonly employed strategy was splitting one's tokens fairly evenly between private investment and group investment. Learning the strategy of free-riding to maximize one's individual return was the third most frequently cited strategy. This was followed closely by the admittance by the participant that he or she had no strategy. Interestingly enough, at least one person in every group reported some type of signaling strategy. He or she would attempt to induce others to invest in the group account by investing heavily in the group account in early rounds. Then, once group investment was high, the participant would switch to the private account and become a free-rider to maximize his or her return.

Conclusion

Game theory cannot explain all of the data presented here or in similar experiments [Stodder pp. 1-2]. Subjects contribute to the public good (group account) even when noncontribution is a dominant strategy. Even the most hard-core economics experimentalist cannot force contribution rates much below the ten percent level.

If one wishes to provide an environment where cooperation or investment in the group account is high, several characteristics of that situation seem to exist. These characteristics are suggested by the research discussed in this paper and the research conducted by others [Ledyard, p. 172]. The group should participate in face-to-face communication. The group should be relatively small. The group should have little experience in economic experiments. The marginal pay-offs to the public good should be reasonably high. The experiment participants should be from a well-defined or bonded group.

Future research will need to replicate the results generated here. Likewise, future research should attempt to generate these same results along with more robust results in larger sample sizes. Finally, future research should attempt to analyze more variables that may contribute to increased group participation in the provision of public goods.

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An Experiment in Income Redistribution and Poverty Measurement

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This classroom experiment is designed to get students to question the notion of income equality and poverty measures. I have found it most useful to employ this experiment prior to any coverage of material on poverty and income inequality. Students are told (in advance) that attending class will cost \$1. The number of students that can actively participate in the

experiment should be limited to approximately ten; the remainder of the students may watch but not participate in the initial discussion. The participants are told that one person will be the beneficiary of the entire sum of money collected. The group must collectively and unanimously decide who that person will be. The beneficiary may not share the money with anyone else in any way; the money must be spent on him/herself exclusively and completely.

The group may use any criteria it chooses to make its decision, with one exception: chance cannot be used to determine the beneficiary (such as drawing straws). The instructor may need to impose slightly more restrictions in a rambunctious class. One class of mine decided to see who could tell the best joke; consequently, I had to disallow this in order to facilitate any meaningful discussion. If the decision is not made within an allotted time (30 minutes is likely to be sufficient), the instructor becomes the beneficiary of the money. This creates a definite impetus to forming a decision.

The discussion usually turns into several interesting avenues. First, the students often attempt to determine who is "deserving" of the money. Who works the hardest? Who is the most altruistic in behavior? Second, students often discuss how the money would be used. Will it be spent on drinking? Food? A gift for a mate? To go home for the weekend? Finally, students often discuss who needs the money most. Who is the poorest? How is this to be determined? What incomes do people have? How much money do parents contribute?

After the time has expired and the students have made their decision, the instructor can invite the entire class to participate in a discussion of the issues raised.

There are several interesting issues that have arisen every time I have run this experiment that can be related to themes in the typical economics textbook:

- (1) In our system of government, taxes are collected and redistributed to others. Does the current welfare system consider who is most deserving of these funds? (Consider responsibility issues, workfare.)
- (2) Do poverty programs consider how beneficiaries will spend their money? (Consider in-kind programs such as food stamps, Medicaid/Medicare, housing assistance.)

(3) How should it be determined who is poor? What measures should be used? (Is poverty an ~~absolute or relative measure?~~ How does the government define poverty?)

~~Keep in mind that this experiment creates a lot of~~ "free flowing" discussion, and the instructor should keep intervention to a minimum. Consequently, it can be more difficult to manage than typical experiments. The potential benefit, however, is an extremely interesting discussion in which students can think about and critically evaluate income inequality and

poverty issues as a result of being directly involved in the experience.

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The Lucas Island Experiment

*Denise Hazlett**

This experiment demonstrates the effects on real aggregate output of anticipated versus unanticipated monetary policy. The experiment follows Lucas's (1972) description of unanticipated monetary disturbances leading to confusion about real values and hence to fluctuations in output. See Sargent (1996) for a description of the precursors to Lucas's idea, and of its legacy. In this experiment, students gradually learn how to anticipate monetary policy, based on past Federal Reserve behavior, and therefore render monetary policy ineffective.

Students take the roles of worker/shopper pairs who each live on an island separated from other pairs in the class. The worker produces a good specific to the island, working at the island's factory, while the shopper visits other islands to buy their goods. The experiment is divided into periods representing days. At the beginning of each period, the worker knows her nominal wage. She will find out the current price level when the shopper returns at the end of the day. In the meantime, she must decide how many hours to work, so she estimates her real wage. The worker faces an intertemporal labor-leisure trade off. She wants to work extra hours when real wages are relatively high, and leisure expensive. She wants to work fewer hours when real wages are relatively low, and leisure cheap.

If the money supply rises unexpectedly, then workers may misinterpret their higher nominal wages to mean high real wages and more expensive leisure. The expansionary monetary policy therefore fools people into working extra hours, leading to an expansion in aggregate output. Likewise, if the money supply falls unexpectedly, workers may misinterpret their lower nominal wages to mean low real wages and less expensive leisure. The contractionary monetary policy therefore fools people into working less, leading to a reduction in aggregate output. However, if workers correctly anticipate the changes in the money supply, then they will correctly estimate their real wage, and not

be fooled into working more or less than their standard eight hour day. Aggregate output therefore does not fluctuate.

~~I ran this experiment in my principles of economics~~ course and in my monetary theory course. All of the following materials refer to the version I ran in the principles course. In 50 minutes, we had time for 13 periods. At the beginning of each period, the instructor serves as a radio announcer delivering reports on aggregate economic activity. In the early periods, students receive no specific information about Fed actions. However, students begin observing a pattern in which if the radio announces that unemployment has been a problem lately, then the price level will rise that period. In later periods this relationship becomes clearer to students, as the report of high unemployment comes with a report of the Fed's resolve to stimulate the economy with expansionary monetary policy. When the Fed stops announcing its policy decisions towards the end of the experiment, students still correctly guess from past Fed behavior that high unemployment will result in the Fed undertaking expansionary monetary policy. Similarly, if the radio announces that inflation had been a problem, then the price level will stabilize or fall that period, as the Fed restricts money growth to fight inflation. The connection between high inflation and the Fed's desire to fight it with contractionary policy becomes clear to students in subsequent periods, when the radio reports Fed announcements. The radio also carries reports of changes in the relative demand for the products of different islands, which students can use to infer changes in their real wages.

Until students recognized the patterns of aggregate activity and Fed behavior, monetary policy caught them off guard. They were fooled into working extra hours when their nominal wages rose, and fewer hours when nominal wages fell, even as their real wages didn't change. However, as students came to understand the goals of the Fed, they became better at predicting Fed behavior, thereby almost completely eliminating fluctuations in output caused by monetary policy. For instructions, discussions questions, a sample record-keeping sheet, and a detailed description of our results, please see the following materials.

References

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Experimental Lucas Island Economy Instruction Sheet

You are about to participate in an experiment what will last several periods, each of which represents a day. You represent a household composed of a worker and a shopper. Your household lives on an island which has a factory that employs your worker. This factory produces a good specific to your island. Each household in this experiment lives on a different island, and the entire economy is composed only of these ten islands. Every household wants to buy goods from all of the islands every day. Because of minimal communication between the islands, you do not know the prices of goods on islands other than your own until your shopper has actually visited the other islands. Before your shopper leaves on his rounds, you must decide how many hours your worker will work that day. At the end of the day, when the shopper returns, you find out the prices of goods on other islands.

On days when her real wage is high, each hour the worker spends working means her household can consume a lot, and she therefore wishes to spend many hours working. However, on days when her real wage is low, the worker would rather spend more time on leisure activities, since she does not give up very much by indulging in leisure. At the beginning of each day the worker is offered a nominal wage (w) in dollars per hour. The real wage, i.e. the nominal wage adjusted for the price level, tells you how much the nominal wage actually purchases. In order to estimate the real wage, you take the nominal wage (w) and divide it by your estimate of the price level (P^e) for that day. Each day you will get some information on the radio which may help you estimate what the price level will be.

To determine the number of hours the worker wishes to work, take the real wage you have estimated, and multiply by $(8/10)$. So, for instance, if the normal wage is 10 and you estimate that the price level will be 1.0, then your worker would work $(8/10)(10/1.0)=8.0$ hours that day. If the nominal wage rises to 11 and you estimate that the price level will stay at 1.0, then the estimated real wage has risen to $(11/1.0)=11$. Since she believes an hour of work buys more goods, your worker will wish to work more. She chooses to work $(8/10)(11/1.1)=8.8$ hours. On the other hand, if when the nominal wage rose from 10 to 11, you believed that the price level most likely also went up by 10% to 1.1 from 1.0, then the estimated real wage is $(11/1.1)=10$, and the number of hours worked is $(8/10)(11/1.1)=8$. Your worker works no more than an 8 hour day, because she does not believe her real wage has risen.

A change in your nominal wage could signal either a shift in the relative demand for the good you produce, or a general change in the prices of all goods. For example, an increase in your nominal wage could be caused by an increase in the relative demand for your product, which makes your employer willing to pay you more because your output is more valuable. So, your real wage has also risen. Similarly, a decrease in your nominal wage could be caused by a decrease in the relative demand for your product, which makes your employer not willing to pay you as much, because your output is less valuable. So, your real wage has also fallen. On the other hand, a change in your nominal wage might be the result of inflation, i.e. a general change in the prices of all goods and services. In this case, your real wage remains unchanged.

At the beginning of each period, you will find out your nominal wage for that day. Then, you will hear the daily news from the radio, which may give you some information you can use to estimate the price level. On the attached record-keeping sheet, you will write down your nominal wage, your estimate of the price level, and the hours your worker will work. Then, you find out the actual price level, you calculate your actual real wage, and the period ends.

LAB REPORT

You have just participated in the Lucas Island Experiment. The results for the experiment as well as the information participants received from the radio broadcast are given on the following pages. Write a lab report in which you address the following questions. I will return your calculation sheets so that you can use them to write the report. Please attach these sheets to your finished report.

1. How did you estimate your real wage, given the information available? Why should participants use their estimated real wage (rather than their nominal wage) to determine how many hours to work on any particular day?
2. Consider the periods in which you incorrectly estimated the price level. How many hours would you have worked in each of these periods if your estimate of the price level had been correct? How did price level surprises (i.e., differences between the actual price level and your estimate of the price level) affect your work effort?
3. If everyone had correctly anticipated the price level in every period, then total hours worked would have been 80 each period. In the periods in which people worked more than 80 hours total, why did they do so? In the periods in which people worked less than 80 hours total, why did they do so? How did aggregate price level surprises (i.e., differences between the actual price level and the average expected price level) affect the number of hours people worked in total?
4. Suppose the Fed desires to increase the amount of aggregate output produced and so will use an increase in the money supply to stimulate the economy. In period 8 the Fed announced it was going to do this. Did the monetary policy increase output? Would this monetary policy have increased output if the Fed had increased the money supply but not announced what it was going to do?

Day	Information	Island A	Island B	Island C	Island D	Island E	Island F	Island G	Island H	Island I	Island J	Price Level
1	...according to leading economic indicators the economy is growing at a steady rate. Unemployment and inflation are within the target range.	10	10	10	10	10	10	10	10	10	10	1.00
2	...the newest craze is for goods produced on islands B and F	9	12	9	10	9	12	10	9	10	10	1.00
3	...jobs are harder to find - unemployment figures are rising.	10	13	10	11	10	13	11	10	11	11	1.10
4	...the economy is still slowing and unemployment figures are higher than expected.	11	14	11	12	11	14	12	11	12	12	1.20
5	...unemployment is no longer a problem yet inflation figures are higher than those forecasted for the year.	11.5	14.5	11.5	12.5	11.5	14.5	12.5	11.5	12.5	12.5	1.25
6	This morning the news announcer states that it will air regular reports from the Federal Reserve Bank. Today you hear that the Fed met and announced concern about the high rates of inflation and will stop the growth of the money supply.	11.5	14.5	11.5	12.5	11.5	14.5	12.5	11.5	12.5	12.5	1.25
7	...the Fed met and indicated that after looking at leading economic indicators this afternoon it will decide how successful the battle against inflation has been. They stated that they will take no action for the time being.	11.5	14.5	11.5	12.5	11.5	14.5	12.5	11.5	12.5	12.5	1.25
8	...the Fed met and reported that it feels inflation is no longer a threat, but it is concerned with high unemployment, and will stimulate the economy by increasing the money supply.	12	15	12	13	12	15	13	12	13	13	1.30
9	...the Fed met and expressed a continued concern with the high levels of unemployment. The chair announced that the Fed will continue to increase the money supply. You also learn that people are finding factory A's, E's, G's and J's widgets defective.	12	17	14	14	12	16	13	14	15	13	1.40
10	...leading economic indicators suggest that unemployment is no longer a problem. The Fed did not meet today. The problem at factories A, E, G, and J are fixed but demand for their products is still low.	12	17	14	14	12	16	13	14	15	13	1.40
11	...the chairman of the Federal Reserve was replaced today. The new chair announced that the Fed met and would not reverse its decision. Leading economic indicators suggest slower than predicted growth; unemployment is high.	13	18	15	15	13	17	14	15	16	14	1.50
12	...the Fed met. LEIs indicate continued high unemployment rates.	14	19	16	16	14	18	15	16	17	15	1.60
13	...the Fed met. LEIs indicate that the economy is stabilizing.	14	19	16	16	14	18	15	16	17	15	1.60
14	...the Fed met and announced a concern with inflation: it is too high. The chair, you learn, thinks that inflation is totally unacceptable and he will attempt to shrink the money supply.	12.5	17.5	14.5	14.5	12.5	16.5	13.5	14.5	15.5	13.5	1.45

Day One						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	10.00	1.00	10.00	8.00	10.00	8.00
B	10.00	1.20	8.33	6.67	10.00	8.00
C	10.00	1.05	9.52	7.62	10.00	8.00
D	10.00	1.00	10.00	8.00	10.00	8.00
E	10.00	1.10	9.09	7.27	10.00	8.00
F	10.00	1.00	10.00	8.00	10.00	8.00
G	10.00	1.00	10.00	8.00	10.00	8.00
H	10.00	1.03	9.71	7.77	10.00	8.00
I	10.00	1.00	10.00	8.00	10.00	8.00
J	10.00	1.00	10.00	8.00	10.00	8.00
average expected price level: 1.04 actual price level: 1.00 total hours worked: 77.33 total hours people would have worked with perfect information: 80.00						

Day Three						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	10.00	.90	11.11	8.89	9.09	7.27
B	13.00	1.00	13.00	10.40	11.82	9.45
C	10.00	.98	10.20	8.16	9.09	7.27
D	11.00	1.20	9.17	7.33	10.00	8.00
E	10.00	1.10	9.09	7.27	9.09	7.27
F	13.00	1.00	13.00	10.40	11.82	9.45
G	11.00	1.10	10.00	8.00	10.00	8.00
H	10.00	1.04	9.62	7.69	9.09	7.27
I	11.00	.90	12.22	9.78	10.00	8.00
J	11.00	.90	12.22	9.78	10.00	8.00
average expected price level: 1.01 actual price level: 1.10 total hours worked: 87.71 total hours people would have worked with perfect information: 80.00						

Day Two						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	9.00	1.10	8.18	6.55	9.00	7.20
B	12.00	1.20	10.00	8.00	12.00	9.60
C	9.00	1.00	9.00	7.20	9.00	7.20
D	10.00	1.10	9.09	7.27	10.00	8.00
E	9.00	.90	10.00	8.00	9.00	7.20
F	12.00	1.10	10.91	8.73	12.00	9.60
G	10.00	1.00	10.00	8.00	10.00	8.00
H	9.00	1.03	8.74	6.99	9.00	7.20
I	10.00	1.10	9.09	7.27	10.00	8.00
J	10.00	1.10	9.09	7.27	10.00	8.00
average expected price level: 1.06 actual price level: 1.00 total hours worked: 75.28 total hours people would have worked with perfect information: 80.00						

Day Four						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	11.00	1.10	10.00	8.00	9.17	7.33
B	14.00	1.20	11.67	9.33	11.67	9.33
C	11.00	1.10	10.00	8.00	9.17	7.33
D	12.00	1.20	10.00	8.00	10.00	8.00
E	11.00	1.20	9.17	7.33	9.17	7.33
F	14.00	1.20	11.67	9.33	11.67	9.33
G	12.00	1.20	10.00	8.00	10.00	8.00
H	11.00	1.05	10.48	8.38	9.17	7.33
I	12.00	1.20	10.00	8.00	10.00	8.00
J	12.00	1.30	9.23	7.38	10.00	8.00
average expected price level: 1.18 actual price level: 1.20 total hours worked: 81.77 total hours people would have worked with perfect information: 80.00						

Day Five						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	11.50	1.30	8.85	7.08	9.20	7.36
B	14.50	1.25	11.60	9.28	11.60	9.28
C	11.50	1.30	8.85	7.08	9.20	7.36
D	12.50	1.30	9.62	7.69	10.00	8.00
E	11.50	1.20	9.58	7.67	9.20	7.36
F	14.50	1.275	11.37	9.10	11.60	9.28
G	12.50	1.25	10.00	8.00	10.00	8.00
H	11.50	1.50	7.67	6.13	9.20	7.36
I	12.50	1.40	8.93	7.14	10.00	8.00
J	12.50	1.25	10.00	8.00	10.00	8.00
average expected price level: 1.30 actual price level: 1.25 total hours worked: 77.17 total hours people would have worked with perfect information: 80.00						

Day Seven						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	11.50	1.25	9.20	7.36	9.20	7.36
B	14.50	1.25	11.60	9.28	11.60	9.28
C	11.50	1.25	9.20	7.36	9.20	7.36
D	12.50	1.25	10.00	8.00	10.00	8.00
E	11.50	1.20	9.58	7.67	9.20	7.36
F	14.50	1.25	11.60	9.28	11.60	9.28
G	12.50	1.25	10.00	8.00	10.00	8.00
H	11.50	1.30	8.85	7.08	9.20	7.36
I	12.50	1.25	10.00	8.00	10.00	8.00
J	12.50	1.25	10.00	8.00	10.00	8.00
average expected price level: 1.25 actual price level: 1.25 total hours worked: 80.02 total hours people would have worked with perfect information: 80.00						

Day Six						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	11.50	1.90	6.05	4.84	9.20	7.36
B	14.50	1.20	12.08	9.67	11.60	9.28
C	11.50	1.25	9.20	7.36	9.20	7.36
D	12.50	1.10	11.36	9.09	10.00	8.00
E	11.50	1.15	10.00	8.00	9.20	7.36
F	14.50	1.25	11.60	9.28	11.60	9.28
G	12.50	1.25	10.00	8.00	10.00	8.00
H	11.50	1.30	8.85	7.08	9.20	7.36
I	12.50	1.25	10.00	8.00	10.00	8.00
J	12.50	1.25	10.00	8.00	10.00	8.00
average expected price level: 1.29 actual price level: 1.25 total hours worked: 79.32 total hours people would have worked with perfect information: 80.00						

Day Eight						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	12.00	1.25	9.60	7.68	9.23	7.38
B	15.00	1.30	11.54	9.23	11.54	9.23
C	12.00	1.30	9.23	7.38	9.23	7.38
D	13.00	1.30	10.00	8.00	10.00	8.00
E	12.00	1.30	9.23	7.38	9.23	7.38
F	15.00	1.30	11.54	9.23	11.54	9.23
G	13.00	1.20	10.83	8.67	10.00	8.00
H	12.00	1.30	9.23	7.38	9.23	7.38
I	13.00	1.30	10.00	8.00	10.00	8.00
J	13.00	1.30	10.00	8.00	10.00	8.00
average expected price level: 1.29 actual price level: 1.30 total hours worked: 80.96 total hours people would have worked with perfect information: 80.00						

Day Nine						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	12.00	.70	17.14	13.71	8.57	6.86
B	17.00	1.40	12.14	9.71	12.14	9.71
C	14.00	1.30	10.77	8.62	10.00	8.00
D	14.00	1.40	10.00	8.00	10.00	8.00
E	12.00	1.30	9.23	7.38	8.57	6.86
F	16.00	1.35	11.85	9.48	11.43	9.14
G	13.00	1.40	9.29	7.43	9.29	7.43
H	14.00	1.35	10.37	8.30	10.00	8.00
I	15.00	1.50	10.00	8.00	10.71	8.57
J	13.00	1.35	9.63	7.70	9.29	7.43
average expected price level: 1.31 actual price level: 1.40 total hours worked: 88.34 total hours people would have worked with perfect information: 80.00						

Day Eleven						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	13.00	1.40	9.29	7.43	8.67	6.93
B	18.00	1.50	12.00	9.60	12.00	9.60
C	15.00	1.50	10.00	8.00	10.00	8.00
D	15.00	1.50	10.00	8.00	10.00	8.00
E	13.00	1.50	8.67	6.93	8.67	6.93
F	17.00	1.45	11.72	9.38	11.33	9.07
G	14.00	1.50	9.33	7.47	9.33	7.47
H	15.00	1.60	9.38	7.50	10.00	8.00
I	16.00	1.50	10.67	8.53	10.67	8.53
J	14.00	1.50	9.33	7.47	9.33	7.47
average expected price level: 1.50 actual price level: 1.50 total hours worked: 80.31 total hours people would have worked with perfect information: 80.00						

Day Ten						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	12.00	1.35	8.89	7.11	8.57	6.86
B	17.00	1.40	12.14	9.71	12.14	9.71
C	14.00	1.37	10.22	8.18	10.00	8.00
D	14.00	1.30	10.77	8.62	10.00	8.00
E	12.00	1.25	9.60	7.68	8.57	6.86
F	16.00	1.45	11.03	8.83	11.43	9.14
G	13.00	1.40	9.29	7.43	9.29	7.43
H	14.00	1.50	9.33	7.47	10.00	8.00
I	15.00	1.40	10.71	8.57	10.71	8.57
J	13.00	1.40	9.29	7.43	9.29	7.43
average expected price level: 1.38 actual price level: 1.40 total hours worked: 81.02 total hours people would have worked with perfect information: 80.00						

Day Twelve						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	14.00	1.50	9.33	7.47	8.75	7.00
B	19.00	1.60	11.88	9.50	11.88	9.50
C	16.00	1.55	10.32	8.26	10.00	8.00
D	16.00	1.60	10.00	8.00	10.00	8.00
E	14.00	1.60	8.75	7.00	8.75	7.00
F	18.00	1.60	11.25	9.00	11.25	9.00
G	15.00	1.60	9.38	7.50	9.38	7.50
H	16.00	1.60	10.00	8.00	10.00	8.00
I	17.00	1.60	10.63	8.50	10.63	8.50
J	15.00	1.60	9.38	7.50	9.38	7.50
average expected price level: 1.59 actual price level: 1.60 total hours worked: 80.72 total hours people would have worked with perfect information: 80.00						

Day Thirteen						
island	nominal wage offered	expected price level	expected real wage	hours you will work	real wage	hours would have worked with perfect information
A	14.00	1.60	8.75	7.00	8.75	7.00

B	19.00	1.60	11.88	9.50	11.88	9.50
C	16.00	1.60	10.00	8.00	10.00	8.00
D	16.00	1.60	10.00	8.00	10.00	8.00
E	14.00	1.60	8.75	7.00	8.75	7.00
F	18.00	1.60	11.25	9.00	11.25	9.00
G	15.00	1.60	9.38	7.50	9.38	7.50
H	16.00	1.65	9.70	7.76	10.00	8.00
I	17.00	1.60	10.63	8.50	10.63	8.50
J	15.00	1.60	9.38	7.50	9.38	7.50
average expected price level: 1.61 actual price level: 1.60 total hours worked: 79.76 total hours people would have worked with perfect information: 80.00						

