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## Security of property as a public good: Institutions, socio-political environment and experimental behavior in five countries

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## Appendix – not intended for publication

### Appendix A – Measures of crime incidence, perception of safety, trust and governance

The first two columns in Table A1 show the share of respondents who answered “yes” to each of the two questions we considered in order to gauge the frequency of property crimes in the countries where we conducted the experiments. The source of the data is the United Nations’ International Crime Victims Survey (ICVS). We used information from years 2000 in the case of Mongolia (N=944) and South Korea (N=2,043), 2004 for Mexico (N=1,992) and the U.S. (N=2,011), and 2005 for Austria (N=2,004). The third column presents our measure for the incidence of crime, defined as the share of respondents who replied positively to either question.

**Table A1: Incidence of crime**

	Share (%) of respondents who answered "yes" to the question:		Incidence of crime
	Over the past 5 years, did anyone actually get into your house or flat without permission and steal or try to steal something?	Over the past 5 years, has anyone taken something from you, by using force, or threatening you? Or did anyone try to do so?	
Austria	6.14	2.00	7.88
Mexico	10.89	9.54	18.72
Mongolia	27.21	10.85	34.04
South Korea	15.02	1.42	15.91
U.S.A.	5.99	3.33	8.35

The first two columns in Table A2 present the shares of respondents who reported in the ICVS feeling unsafe, as judged by their perceptions of safety when walking in the dark or the chances that their homes get broken into over the course of the following year. The third column shows the composite measure of safety perceptions obtained by applying factor analysis on the previous two metrics.

**Table A2: Perceptions of safety**

	Share (%) of respondents who report feeling “a bit unsafe” or “very unsafe” when walking alone after dark	Share (%) of respondents who reckon it is “likely” or “very likely” that over the next twelve months someone will try to break into their homes	Perception of safety
Austria	21.7	27.74	-0.08
Mexico	34.59	37.00	0.17
Mongolia	53.81	20.87	0.19
South Korea	21.93	31.03	0.02
U.S.A.	20.07	14.92	-0.15

On trust, we employ data from miscellaneous attitudes surveys conducted around the world in recent years (e.g., the World Values Survey, East Asia Barometer, Latinobarómetro, the European Values Survey) on what has come to be called the “generalized trust question,” namely, “Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?” The trust index is constructed based on the formula

$$\text{Trust index} = 100 + (\% \text{ Most people can be trusted}) - (\% \text{ Can't be too careful}).$$

Thus, scores over 100 are observed in countries where a larger share of people trust others, whereas scores below 100 correspond to countries where a majority of people have reservations in their dealings with others.<sup>1</sup> Table A3 shows the scores of our pool of five countries.

**Table A3: Trust index**

	Source	Year	Trust index
Austria	European Values Survey	1999	70.2
Mexico	Latinobarómetro	2008	41.7
Mongolia	East Asian Barometer	2006	21.4
South Korea	World Values Survey	2005	56.9
U.S.A.	World Values Survey	2006	78.8

The Government Index was constructed from three variables—government effectiveness, rule of law, and control of corruption—included in a dataset of governance measures assembled by the World Bank. Government effectiveness is meant to capture “perceptions of the quality of

<sup>1</sup> See <http://www.jdsurvey.net/jds/jdsurveyMaps.jsp?Idioma=I&SeccionTexto=0404&NOID=104>

public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.” Rule of law represents “perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.” And control of corruption embodies “perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests.”<sup>2</sup>

**Table A4: Governance index**

	Government effectiveness	Rule of law	Control of corruption	Governance Index
Austria	1.78	1.83	1.94	1.90
Mexico	0.17	-0.42	-0.20	-0.14
Mongolia	-0.46	-0.16	-0.42	-0.37
South Korea	1.02	0.90	0.47	0.78
U.S.A.	1.60	1.53	1.53	1.59

Each of these governance measures, shown in the first three columns of Table A4, is expressed in units ranging from -2.5 to 2.5, with higher values denoting better governance outcomes. We averaged each country’s score in each dimension across the 2000-2009 period and computed via factor analysis the Governance Index, which appears in the last column.

## **Appendix B – Analysis of optimal tokens for production in VOTE**

If the group mandates a contribution of 3, there will be a joint “overprovision” by a total of 2 tokens, but with only 28% chance of a theft succeeding and hence an expected gain of only 2.8 wealth tokens from each token allocated to theft, it is unambiguous that all 7 remaining tokens

<sup>2</sup> For more information on the measures, see <http://info.worldbank.org/governance/wgi/index.asp>

should be devoted to production (see again Table 1), yielding expected earnings of 64 wealth tokens per period. If the group chooses a mandatory allocation of 2, the 10 tokens in collective protection will yield a 60% protection level and thus an expected gain of 4 wealth tokens from a token allocated to theft, causing a risk-neutral subject to put no more than 7 tokens into production and to be indifferent between putting a seventh token into production versus putting only six into production and one into theft. Assuming risk-neutrality, subjects would choose randomly between 6 versus 7 tokens in production, so expected earnings would be 62 tokens ( $= 0.5 \times 60 + 0.5 \times 64$ ), making the three token requirement the better choice. Assuming subjects were slightly risk-averse, however, all would choose to put a seventh token into production given a 60% protection rate, so earnings would be 64 wealth tokens, the same as when each contributes three tokens (mandatorily) to collective protection. With even stronger risk-aversion, subjects facing 60% collective protection might even prefer putting an eighth token into production, with certain return of 3 wealth tokens, to putting one effort token into theft, with expected return of 4 wealth tokens but a 40% chance of obtaining nothing. Thus, assumptions of strong risk-aversion could lead to a preference for mandating a 2 rather than 3 token allocation to collective protection, since the number of wealth tokens each produces could be 67 under this assumption. Although the earnings outcome associated with a 2 token requirement thus ranges from 62 to 67 wealth tokens, depending on degree of risk aversion, we treat 64 as the benchmark predicted earnings under the mandatory allocations scheme, since it is achieved exactly in two plausible scenarios and is close to the unweighted average outcome of the four scenarios considered.

## **Appendix C – Representativeness of student subjects**

### **C.1 Student and general population responses to survey questions**

One way to investigate whether our student subject pools are representative of the general population in their countries is to compare the survey responses they provided at the end of their experiment sessions (or in the case of the Mexican subjects, one or more weeks before those

sessions<sup>3</sup>) with those of larger surveys, such as the World Values Survey. Two questions conducive to such comparison are one regarding self-positioning on a left-to-right political spectrum and one regarding the trustworthiness of others. We display the relevant data in Table C1. On trust, we have subject responses from three of our subject pools to a question about the likelihood of a lost wallet being returned, and for all five countries, responses to the generalized trust question drawn from the World Values Survey (WVS), East Asia Barometer (EAB) and the European Values Survey (EVS) (see Appendix A). For the three countries for which both measures are available, there is a consistent ordering, with both the highest expectation that the wallet would be returned and the highest generalized trust in the U.S., the lowest response on both in Mexico, and a middle position for Austria.

**Table C1: Average survey responses by subject pool in country surveys**

Category and variable	Description and source	Country				
		Austria***	Mexico*	Mongolia**	South Korea*	U.S.*
Trust						
Wallet return <sup>a</sup>	Post- or pre-experiment survey	2.83	2.51	n.a.	n.a.	3.02
Generalized trust <sup>b</sup>	WVS/EAB/EVS	36.8	15.6	10.2	28.2	39.3
Political Outlook <sup>c</sup>	Post- or pre-experiment survey	1.52	3.23	1.98	1.76	2.11
	WVS/EAB/EVS	2.7	3.1	n.a.	2.9	2.85

Sources: \*World Values Survey Wave 5 (2005-2008); \*\*East Asia Barometer (2006); \*\*\*European Values Survey (1999)

<sup>a</sup> 1=0-20%; 2=21-40%; 3=41-60%; 4=61-80%; 5=81-100%

<sup>b</sup> % of respondents saying "most can be trusted" to the generalized trust question

<sup>c</sup> 1=very liberal,..., 5=very conservative

We have data on self-reported political outlook from both our subject survey and the WVS/EVS for four countries, data for Mongolia being unavailable in the EAB. In this case, our own survey question wording is identical to that in the WVS and EVS. For these four countries there is consistency between the two sources insofar as Austria is the most liberal and Mexico the most conservative. The orderings for the two countries in the middle, South Korea and the U.S., differ by survey, although their WVS values are essentially the same. In the case of political outlook, the numbers suggest that with the exception of our Mexican site, the university students were more politically liberal than the general populations of their countries.

<sup>3</sup> In order to minimize the danger of influencing subjects' behaviors during the experiment by asking questions about attitudes towards theft prior to their experiment session, the pre-experiment survey of ITAM students in Mexico City included more than three times the number of questions as the post-experiment surveys administered elsewhere, with questions on theft interspersed among questions on various other political and social topics.

## **C.2 Experiments with non-student subjects in Mongolia**

A different type of information about external validity comes from conducting the same experiment with a different subject pool. Batsaikhan had the opportunity to carry out sessions of the **VCP** and **VOTE** treatments with 80 subjects recruited from among a group of small-scale entrepreneurs whose business practices he was engaged in studying for other purposes. Decision-making by members of this non-student subject pool has considerable qualitative overlap with that of the student subject pools. Interestingly, the Mongolian entrepreneurs achieved 3.5% (8.7%) higher earnings than the Mongolian students in the **VCP** (**VOTE**) treatments, even exceeding the average earnings of student subjects in the five countries as a whole by 0.4% (1.2%), although still earning less than the best-performing subject pools. The finding that social cooperation is if anything somewhat greater in subject populations of older adults is a common one (see Sutter and Kocher, 2007). Another interesting finding is that entrepreneurs who are more successful in their real world business activity devoted significantly more tokens to production in the first period of the experiment than did less successful entrepreneurs. Details are in Mongoljin Batsaikhan, “Why are Some Entrepreneurs Successful? The Implications of Decisions in Lab Experiments for Business Outcomes,” (in progress).

## **Appendix D – Why is there lower-than-predicted theft and higher-than-predicted private protection?**

The investment in private protection was higher than predicted and this difference was in many periods sufficient to make the observed (low) levels of theft rational. But these allocations to protection remain unexplained by either payoff-maximization or risk-aversion. We briefly explore three alternative explanations: loss aversion, moral reservations, and asymmetric protective motives.

### D.1 Loss aversion

In Section 2, we saw that a self-interested, rational and non-risk-loving subject would expect group members to allocate seven tokens to theft and three to production each period. Relative to that choice, withdrawing a token from theft reduces the decision-maker's earnings by ten tokens and devoting that token instead to private protection increases expected earnings by maintaining possession of seven tokens that would otherwise be forfeited. A subject might prefer this alternative if she values seven tokens that are in her existing accumulation more than she values ten tokens she could steal from another's. Possible reasons for such a preference are loss aversion and the devaluation of stolen tokens by moral taint.

Loss aversion can be modeled formally by assuming that subject  $i$  seeks to maximize the sum of utility from final wealth and gain-loss utility taking the form used by Koszegi and Rabin (2006):

$$\mu(x) = \begin{cases} \eta x & \text{if } x > 0 \\ \eta \lambda x & \text{if } x < 0 \end{cases}$$

where  $\eta$  is the weight placed on gain-loss utility,  $x$  are the gains ( $x > 0$ ) or losses ( $x < 0$ ), and  $\lambda > 1$  is the coefficient of loss aversion. Then, treating wealth tokens accumulated through theft as gains and wealth tokens lost to theft as losses, it can be shown that the utility for subject  $i$  is higher under profile  $(m_i, T_i - 1, p_i + 1)$  than under profile  $(m_i, T_i, p_i)$  as long as  $\lambda > 10(1 - 0.1p_i)/T_i$ . For example, if all members of a group are devoting four tokens to theft and two to private protection, it follows from the formula that subject  $i$  is better off allocating a third token to protection as long as  $\lambda > 2$ . A  $\lambda$ -value of two may be plausible, since Tversky and Kahneman (1992) provide a median estimate of 2.25 for  $\lambda$ .

### D.2 Moral reservations

Reluctance to steal on moral grounds is another factor that might plausibly account for lower-than-predicted allocations to theft. It is noteworthy that in the first period of the **NCP** treatment, where subjects determined their allocations to theft and private protection in the complete absence of signals of others' plans, roughly one quarter of subjects did not allocate any token to theft. Since allocations to private protection large enough to make even a one-token allocation to theft unprofitable were only a remote possibility, this much forbearance from theft probably indicates that substantial numbers of subjects were reluctant to steal before being given the "moral green light" to do so that would come from others' stealing.



Although substantial allocations to private protection may explain lower-than-expected theft levels, some causation could run in the opposite direction. We conducted the following exercise to check whether private protection could have been motivated in this way.

**Table D1: Allocations to private protection**

	<b>NCP</b>		<b>VCP</b>			<b>NCP &amp; VCP</b>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Optimal allocation	0.794*** (0.077)	0.780*** (0.074)	0.772*** (0.083)	0.760*** (0.081)	0.744*** (0.082)	0.781*** (0.057)	0.770*** (0.055)
Loss through theft in t-1		-0.002* (0.001)		0.001 (0.002)	0.001 (0.002)		-0.001 (0.001)
Loss through theft in t-2		0.001 (0.001)		0.003** (0.001)	0.003** (0.001)		0.001 (0.001)
Accumulated profit thru t-1		0.000 (0.001)		0.000 (0.001)	0.000 (0.001)		0.000 (0.001)
Collective Protection					-1.335* (0.740)		
Gains from theft in t-1		0.010*** (0.002)		0.010*** (0.003)	0.009*** (0.003)		0.009*** (0.002)
Accumulated gains from theft thru t-1		0.001* (0.000)		0.000 (0.001)	0.000 (0.001)		0.001* (0.000)
Constant	2.244*** (0.207)	1.687* (0.933)	1.741*** (0.255)	1.444 (-1.369)	1.704 (1.349)	2.657*** (0.089)	2.576*** (0.155)
Individual FE	Y	Y	Y	Y	Y	Y	Y
Round FE	Y	Y	Y	Y	Y	Y	Y
Observations	3,960	3,960	4,070	4,070	4,070	8,030	8,030
Within R-squared	0.216	0.234	0.134	0.146	0.149	0.167	0.18

Notes: Heteroskedasticity-robust standard errors clustered at the group level are shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Assuming that each observed allocation of less than seven tokens to theft reflects the decision-maker's operative moral constraint, we calculated the individual's expected earnings-maximizing allocation to private protection by individual and period in the **NCP** and **VCP** treatments on the (strong) assumption that he or she correctly anticipated the average amount of theft in which others would engage in each period (presumably based on previous observations).<sup>4</sup> We then estimated equations in which this "optimal allocation to private protection" is included in a regression model of individual period-specific expenditure on private protection that also includes individual and period fixed effects. The results presented in columns (1), (3) and (6) of

<sup>4</sup> Calculations done for the **VCP** treatment deduct the individual's allocation (if any) to collective protection to determine that number of tokens available for production or private protection. Estimates assuming all tokens not used for theft to be available for either production or private protection give essentially the same results, since allocations to collective protection are usually small.

Table D1 suggests that our measure of optimal allocations to private protection is a strong predictor of actual allocations to private protection. The evidence is robust to the inclusion of additional control variables capturing the time-varying performances of subjects, as shown in the rest of the table.

### **D.3 Asymmetric protective motives**

Our third explanatory factor, asymmetric protective motives, refers to anticipation of retaliation after own engagement in theft. Whereas so far we assumed theft tokens to be directed randomly (and thus distributed equally among other group members in expectation), one could argue that theft attempts against, say, subject  $i$ , could have been prompted by  $i$ 's successful stealing in the preceding period. Assuming that  $i$  anticipates this, she may find that the returns to investing a token in private protection are greater than the expected returns to theft (especially when some protection by other group members is in place), thereby making higher-than-predicted private protection more likely. Columns (2), (4), (5) and (7) of Table D1 present evidence of a significant positive correlation between stealing in the previous period and allocations to private protection in the current one.

Although both our gauge of optimal allocations to protection and asymmetric protective motives turn out to be relevant predictors of the actual allocations to private protection, our calculations show that they explain no more than one quarter of the overall average level of those allocations.

## **Appendix References**


- Koszegi, Botond and Matthew Rabin, 2006, "A Model of Reference-Dependent Preferences," *Quarterly Journal of Economics*, 121: 1133-1166.
- Sutter, Matthias and Martin Kocher, 2007, "Trust and Trustworthiness across Different Age Groups," *Games and Economic Behavior*, 29: 364-382.
- Tversky, Amos and Daniel Kahneman, 1992, "Advances in Prospect Theory: Cumulative Representation of Uncertainty," *Journal of Risk and Uncertainty*, 5: 297-323.

## Appendix E – Instructions and practice scripts<sup>5</sup>

### E.1 NCP

#### Instructions

##### General Information

This is an experiment aimed at studying decision-making while interacting with other individuals. During the experiment, you will be earning money in the form of wealth tokens . At the end of the experiment you will be paid in cash in real dollars (1 wealth token = 1.4¢). The amount you will earn will depend on your and others' decisions. Please read and listen carefully to make sure you understand the decision process. At the end of the instructions you will have a chance to ask questions. The experiment will conclude with a brief questionnaire.

##### Your Group

At the beginning of the experiment you will be randomly assigned to a group consisting of yourself and four others. Each member of the group will be randomly assigned a subject number (denoted Sub 0, Sub 1,..., Sub 4) which remains fixed throughout the experiment. You will interact exclusively with the people in your group of five throughout the entire experiment. All decisions are made anonymously, so no participant knows the identities of the other decision makers, nor will you ever be informed who was in your group. Payments are anonymous and will be made in cash at the end of the session.

##### Experiment Structure

The experiment consists of 24 rounds, organized in 6 sets of 4 rounds. Between each set of four rounds, there will be a brief pause. In total, we expect the experiment to last no more than two hours, including these instructions and practice rounds.



##### Communication and questions

Communication is not allowed at any time during the experiment. If you have any questions, please raise your hand and we will come to assist you. Do not hesitate to call on us.

##### Other kinds of tokens

During the experiment, you will have the chance to use two types of tokens. Only wealth tokens will be converted into cash at the end of the experiment. Effort tokens will also play a part, but they only have value insofar as they help you to earn or to conserve wealth tokens.


#### Instructions

At the beginning of the first round, each member of the group (yourself included) will be endowed with 100 wealth tokens . Each round, each of you will receive 10 effort tokens . Effort tokens have no money value, but they can be used to help you earn or conserve wealth tokens.



In every round, you have to allocate your effort tokens among three alternatives:

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<sup>5</sup> Instructions in German, Korean, Mongolian and Spanish are available from the authors upon request.

- ❖ Produce new wealth tokens . The table on the right shows the relation between effort tokens (the input) and wealth tokens (the output). For instance, if you allocate 5 effort tokens to production, you produce 55 wealth tokens which are added to your accumulation.

# Effort Tokens	# Wealth Tokens Produced
1	15
2	28
3	39
4	48
5	55
6	60
7	64
8	67
9	69
10	70

- ❖ Steal others' wealth tokens . You can assign effort tokens to stealing from any other member(s) of the group, such that for every effort token you direct to stealing from, say, member 2, you will have the chance to steal 10 wealth tokens from him/her. The likelihood that your theft attempts succeed depends upon the other member's total degree of security, as described below.
- ❖ Protect your own wealth tokens from being stolen . For every effort token you assign to protection, the probability that you will keep your wealth tokens in the event that someone attempts to steal them rises by 10 percentage points. For example, if you put 4 effort tokens into protection, the likelihood that an attempt to steal wealth tokens from you will fail becomes  $4 \times 10 = 40\%$  (in other words, the likelihood that the attempted theft succeeds is only 60%). The example below illustrates the stealing mechanism as well as the determination of chances.

Example: Member 2 puts 3 effort tokens into protection and member 3 puts 1 effort token into protection. Hence, member 2's degree of protection is  $3 \times 10 = 30\%$ , while 3's level of protection is  $1 \times 10 = 10\%$ . If you direct 2 effort tokens to an attempt to steal from member 2 and 1 effort token to attempting to steal from member 3, 20 of 2's wealth tokens and/or 10 of 3's wealth tokens may be transferred to you. The likelihood of your theft from 2 succeeding is  $100 - 30 = 70\%$ , and the likelihood of your theft from 3 succeeding is  $100 - 10 = 90\%$ . The computer will ultimately determine according to the aforementioned probability of 70% whether 0 or 20 wealth tokens are transferred to you from member 2 (note: there's a 70% chance of 20 tokens being transferred, a 30% chance of 0 tokens being transferred, and no chance of an intermediate amount being transferred). Likewise, the computer will independently decide using the probability 90% whether 0 or 10 wealth tokens are transferred to you from member 3. If a theft is successful, the wealth tokens are deducted from 2's and/or 3's accumulation and are added to yours.

Exception: If the total number of wealth tokens that other members would successfully steal from a particular group member, say member 2, exceeds 2's existing accumulation, then the computer will adjust the size of the transfers, since member 2 cannot end up with a negative number of wealth tokens. For example, suppose members 0, 1, 3 and 4 each direct 3 effort tokens to attempting to steal from Member 2, and that none of the theft attempts is prevented by the action of Member 2's degree of protection, so that a total of  $3 \times 10 \times 4 = 120$  wealth tokens would be taken from member 2. And suppose that member 2 has only 100 wealth tokens at this point. Then members 0, 1, 3 and 4 would each receive only  $100 / 4 = 25$  rather than 30 wealth tokens. The decision of each to direct 3 effort tokens against member 2 is nevertheless irrevocable; each would have spent 3 effort tokens, though gaining only 25 rather than 30 wealth tokens from it.

At the end of each round, the total number of wealth tokens will be computed according to the following formula:  
Wealth tokens = Wealth tokens held at the beginning of the round

- + New wealth tokens produced
- + Wealth tokens you stole from other members
- Wealth tokens other members stole from you

At the end of each round you will learn the statistics of your performance in that round as well as the cumulative statistics through that round. That is, you will find out: (i) the number of wealth tokens produced; (ii) the total number of wealth tokens you sought to steal from others and the number of wealth tokens that you successfully stole; (iii) the number of wealth tokens other group members sought to steal from you and the number of wealth tokens they successfully stole. (Note that the information on (iii) is given as an aggregate; you won't be told which particular group members attempted or succeeded to steal from you.) These amounts will be added/subtracted from the number of wealth tokens that you started the round with, according to the formula described above.

You will also learn about the total accumulation of wealth tokens in the hands of each other group member through that round, and the number of wealth tokens that each group member has thus far obtained by production, the number each has thus far obtained by stealing from others, and the number each has thus far lost by means of theft. This information will be available to you anytime in the following round as you make your allocation decisions.

### **Payoffs**

Your earnings from this experiment will be the \$5 that is guaranteed to you simply for participating, plus 1.4¢ for every wealth token that you have accumulated by the end of the 24 rounds. Notice that your earnings do not depend on how much you accumulate in comparison to others, only on how much you accumulate.

To make sure that you understand how the different choices operate in the experiment, we'll now provide some examples.

### **Examples of protection possibilities**

Example 1: Member 1 allocates 5 effort tokens to protection, member 2 allocates 3 effort tokens to protection, and members 3, 4 and 5 each use 1 effort token for protection. Their corresponding levels of security are 50%, 30%, 10%, 10% and 10%, respectively.

Example 2: Group members use various numbers of effort tokens for protection; for example 6 tokens, 4 tokens, 3 tokens, 1 token, and no tokens. They achieve the corresponding levels of security: 60%, 40%, 30%, 10% and 0%, respectively.

### **Examples of the use of effort tokens and payoffs**

Example 1: You begin with 100 wealth tokens and each round you use all 10 effort tokens to produce wealth tokens. No group member ever attempts to steal wealth tokens from you. You earn 70 wealth tokens each round, accumulating a total of  $100 + (70 \times 24) = 1780$  wealth tokens. Your earnings in dollars would be  $\$5 + (1.4¢ \times 1780) = \$29.92$

Example 2: You begin with 100 wealth tokens and each round you allocate 2 effort tokens to protection and 8 effort tokens to stealing from others. You can steal up to 80 wealth tokens, and there is an 80% ( $= 100 - (2 \times 10)$ ) chance that any given attempt by others to steal wealth tokens from you will succeed. Your maximum accumulation could be  $100 + (80 \times 24) = 2020$  wealth tokens, but you may earn less than this, possibly much less, if others successfully steal wealth tokens from you and/or if others use effort tokens to provide some security for their accumulations. Using the maximum estimate of 2020 wealth tokens, your accumulated earnings in dollars would be  $\$5 + (1.4¢ \times 2020) = \$33.28$

Example 3: You begin with 100 wealth tokens and each round you and others in your group use four effort tokens for production, two effort tokens for protection, and four effort tokens for stealing, assigning one token to stealing from each other group member. You produce 48 wealth tokens, and your protection level each period is 20%. The other members of your group each attempt to steal 10 wealth tokens from you and succeed in 80% of attempts, hence reducing your wealth token accumulation by  $4 \times 10 \times 0.8 = 32$  wealth tokens per period, on average. Your four attempts to steal 10 wealth tokens from other members succeed on 80% of attempts, thus adding  $4 \times 10 \times 0.8 = 32$  wealth tokens to your accumulation per period, on average. Your wealth token accumulation thus rises by an average total of 48 per period, earning you a total of  $100 + (48 \times 24) = 1252$  wealth tokens, for earnings of  $\$5 + (1.4¢ \times 1252) = \$22.53$

Example 4: You begin with 100 wealth tokens and each round you put 3 effort tokens into protection and assign the remaining 7 effort tokens to production. Suppose other members also put 3 effort tokens into protection each period. The likelihood that a theft attempt will succeed is  $100 - (10 \times 3) = 70\%$ . Your 7 effort tokens produce 64 wealth tokens for you each round. You can accumulate up to  $100 + (64 \times 24) = 1636$  wealth tokens, but you may earn less if others steal tokens from you. Using the maximum estimate of 1636 wealth tokens, your total earnings would be  $\$5 + (1.4¢ \times 1636) = \$27.90$ .

Note that the behavior does not change across rounds in these examples, but this is just for the sake of making these illustrations easy to understand. In fact, your strategy can change over time. As can be seen, there are an almost infinite number of possible outcomes, depending on your decisions and the decisions of others in your group.

After questions are answered and we go through two practice rounds that don't affect your earnings, you will engage in the first four periods of the experiment.

Any questions?

### Practice Scripts

Before the real decision-making begins, we're going to go through two practice rounds the purpose of which is to familiarize you with the way that you enter your choices on your computer screen, the order of choice, and the information you get back after each decision. The earnings shown on your screen for these practice rounds are only illustrative, reflecting decisions I'll be asking you to enter. They have no effect on your real earnings in the experiment. Also, the participants with whom you'll interact in the practice rounds are not the ones in your group for the real decision periods. Please follow our instructions as closely as possible and do not click any buttons until told to.

The first screen you'll see tells you that you and each other person in your group has 100 wealth tokens at the beginning of the experiment. Please click next.

The next screen you'll see in each round tells you the number of wealth tokens and the number of effort tokens with which you begin the round. Please click next.

The next screen is where you have to enter your allocation choices to production, protection and theft. You have to click on at least some of the boxes below the lines saying "production tokens," "protection tokens" and "theft tokens", until you finish allocating all your effort tokens.

Please use your effort tokens as follows (and do not click submit until we tell you to):

- Assign 5 effort tokens to the production of new wealth tokens and 3 to the protection of your existing wealth tokens.

- Randomly assign your remaining 2 effort tokens to stealing from other members of your group.

Before leaving this screen, please notice the following: (a) you can click on the button labeled “Stats” at the top to learn the number of wealth tokens held by the others in your group; (b) when you enter a number of production tokens, you’ll see immediately below that box the number of Wealth tokens you’ll produce if you stick with that choice; (c) when you enter a number of protection tokens, you’ll see below that box the total level of security of your wealth token accumulation.

Before clicking on the submit button, please also notice that it is possible to reconsider and to change your allocations at any time until you hit submit. Simply delete any entry you want to change and enter a new value. Also note that you don’t need to enter a value into each box. If you enter no value under production tokens, for instance, the computer will understand your production tokens choice to be 0. The same applies to protection and theft tokens. You can always choose 0 in any case. If the number of effort tokens you use for the round does not sum to 10 in total, you will receive an error message and will have to change entries until all of your effort tokens have been used. If you are ready, click on Submit now.

Note that if all participants haven’t yet made their decisions and clicked submit, you’ll see a screen saying “Waiting for Others”. There is no possibility of seeing what others decide first and then making your own decision.

When everyone has submitted their decisions you’ll see a “Round Performance Summary.” Please read it and raise your hand if you have any questions about this screen. When you’re done, please click on Next.

The next screen gives you information about the wealth token accumulations of each member in your group. Notice that there are two boxes: (1) the upper box shows the accumulations of each group member broken up into gains and losses through production and theft *through* the period that just ended; (2) the lower box shows the accumulations of each group member broken up into gains and losses through production and theft *in* the period that just ended. Please click on Next Round.

We’ll now run through a second and final practice round. Remember, the practice rounds do not count towards determining your earnings. Again, please follow our instructions for this one last practice round.

Notice that your first screen of the round tells you your updated accumulation of wealth tokens. Note that you begin every round with the same number of effort tokens, 10. Please click next.

Again, the next screen is for indicating your allocation choices to production, protection and theft.

Notice that you can also click on the Stats button here to view again the accumulations of each group member and the break-down according to production, gains from theft and losses due to theft. If you want the stats to disappear, you can click Hide, otherwise they will go away automatically when you click submit, but you can view them again at the next decision stage.

At the second allocation screen, please allocate your effort tokens as follows:

- 6 to production,
- 1 to protection, and
- For your theft choices, please open again the Stats window. In the real experiment, you may want to use the information in that window to help you decide whom you try to steal from. For this practice round, as an illustration, please assign 2 effort tokens to whichever member of your group (excluding yourself) has the smallest accumulation of wealth tokens after Practice 1 (check the stats window). If more than one member is tied for smallest accumulation, choose one randomly to assign your effort tokens to. Finally, assign 1 effort token to whichever member of your group has the 2<sup>nd</sup> smallest accumulation of wealth tokens.

When everyone has submitted their decisions you'll see the Round Performance Summary, as before. When you're ready, please click on Next.

Finally, as before, the next screen gives you information about the wealth token accumulations of each group member broken up into gains and losses through production and theft.

Before we begin the rounds that count toward your real earnings, please note that the time it will take to complete all 24 rounds depends on all of your rates of progress. No individual can move forward until all participants make the corresponding decisions at each stage of the process, which includes, at the end of each period, that you finish viewing your round performance summary and click "next." Please focus on the task and click the appropriate "submit" and "next" buttons as soon as you are ready to do so, so that the process can proceed for all in a timely fashion. To help make sure that we finish before \_\_ \_\_, we'll remind you to continue if we see that progress stalls. (We can track on our monitor whether actions have been taken but not which actions they were, that information is stored only for later analysis.)


O.k.? Please begin.

## **E.2 VCP**

### **Instructions**

#### **General Information**

This is an experiment aimed at studying decision-making while interacting with other individuals. During the

experiment, you will be earning money in the form of wealth tokens . At the end of the experiment you will be paid in cash in real dollars (1 wealth token = 1.4¢). The amount you will earn will depend on your and others' decisions. Please read and listen carefully to make sure you understand the decision process. At the end of the instructions you will have a chance to ask questions. The experiment will conclude with a brief questionnaire.

#### **Your Group**

At the beginning of the experiment you will be randomly assigned to a group consisting of yourself and four others. Each member of the group will be randomly assigned a subject number (denoted Sub 0, Sub 1,..., Sub 4) which remains fixed throughout the experiment. You will interact exclusively with the people in your group of five throughout the entire experiment. All decisions are made anonymously, so no participant knows the identities of the other decision makers, nor will you ever be informed who was in your group. Payments are anonymous and will be made in cash at the end of the session.

#### **Experiment Structure**

The experiment consists of 24 rounds, organized in 6 sets of 4 rounds. Between each set of four rounds, there will be a brief pause. In total, we expect the experiment to last no more than two hours, including these instructions and practice rounds.

#### **Communication and questions**



Communication is not allowed at any time during the experiment. If you have any questions, please raise your hand and we will come to assist you. Do not hesitate to call on us.





#### **Other kinds of tokens**



During the experiment, you will have the chance to use two types of tokens. Only wealth tokens will be converted into cash at the end of the experiment. Effort tokens will also play a part, but they only have value insofar as they help you to earn or to conserve wealth tokens.



### Instructions

At the beginning of the first round, each member of the group (yourself included) will be endowed with 100 wealth tokens . Each round, each of you will receive 10 effort tokens . Effort tokens have no money value, but they can be used to help you earn or conserve wealth tokens. There are three activities you can perform using your effort tokens:


- Produce more wealth tokens 
- Steal others' wealth tokens 
- Protect your own wealth tokens from being stolen in one or both of two ways: collective protection , which adds to the security of all members' wealth tokens, and private protection , which adds to the security of the wealth tokens of the person who pays for it only

We next explain the order of decision-making and provide more details about the activities of production, theft, and protection.


In every round, decisions are made in two stages:

- Stage 1: you have to decide how many of your 10 effort tokens you contribute to collective protection , whereby the wealth tokens of every member are equally protected if another member seeks to steal them. For every effort token that any member of the group puts into collective protection, the probability that you (and each person in your group) will keep your wealth tokens if someone attempts to steal them will rise by 6 percentage points on a scale of 0-100%. The highest level of security that can be attained through collective protection is reached if the sum of everyone's contributions is 12 effort tokens (or more). In that case, there is a  $12 \times 6 = 72\%$  chance that a member's wealth tokens will remain with them in the event of an attempt to steal them. Greater contributions beyond 12 effort tokens do not increase the probability that you will keep your wealth tokens. At the end of Stage 1, you will learn the total number of effort tokens put into collective protection and the resulting degree of security at which theft is prevented, but you will not learn how many tokens each individual put into collective protection.
- Stage 2: In this stage, you have to allocate your remaining effort tokens among three alternatives: private protection, production and theft.
  - ✓ Private protection  is meant to provide further protection to your own wealth tokens only. For every effort token you assign to private protection, the probability that you will keep your wealth tokens in the event that someone attempts to steal them rises by 10 percentage points, which will be added to the level of security already achieved through collective protection. For example, if collective protection is 54% (i.e., 9 effort tokens were contributed in total) and you put 4 effort tokens into private protection, the likelihood that an attempt to steal wealth tokens from you will fail increases to  $54 + (4 \times 10) = 94\%$  (in other words, the likelihood that the attempted theft succeeds is only 6%). Of course, you cannot increase the likelihood of failure beyond 100%, so at some point, additional effort tokens lose their effect. In our example, if you put 5 effort tokens into private protection, the 5<sup>th</sup> effort token raises the likelihood of a theft attempt failing by 6% only, to 100%, and a 6<sup>th</sup> effort token would have no effect. Note that effort tokens put into collective protection benefit all members equally, and that everyone knows this degree of security

in each round; however, private protection benefits only you, and only you know how many effort tokens you use for private protection, thereby your own total level of protection.

- ✓ Production  of new wealth tokens. The table on the right shows the relation between effort tokens (the input) and wealth tokens (the output). For instance, if you allocate 5 effort tokens to production, you produce 55 wealth tokens which are added to your accumulation.

# Effort Tokens	# Wealth Tokens Produced
1	15
2	28
3	39
4	48
5	55
6	60
7	64
8	67
9	69
10	70

- ✓ Theft  enables any member to steal wealth tokens from any other member(s) of the group with a likelihood of success that depends upon the other members' total degree of security, as already described. You can assign effort tokens to stealing from any of the other members, such that for every effort token you direct to stealing from, say, member 2, you will have the chance to steal 10 wealth tokens from him/her. The example below illustrates the stealing mechanism as well as the determination of chances.

Example: Group members put a total of 5 effort tokens into collective protection, so the degree of security provided through collective protection is  $5 \times 6\% = 30\%$ . Member 2 puts 3 effort tokens into private protection and member 3 puts no effort tokens into private protection. Hence, 2's total degree of protection is  $30 + (3 \times 10) = 60\%$ , while 3's total level of protection is  $30 + (0 \times 10) = 30\%$ . If you direct 2 effort tokens to an attempt to steal from member 2 and 1 effort token to attempting to steal from member 3, 20 of 2's wealth tokens and/or 10 of 3's wealth tokens may be transferred to you. The likelihood of your theft from 2 succeeding is  $100 - 60 = 40\%$ , and the likelihood of your theft from 3 succeeding is  $100 - 30 = 70\%$ . The computer will ultimately determine according to the aforementioned probability of 40% whether 0 or 20 wealth tokens are transferred to you from member 2 (note: there's a 40% chance of 20 tokens being transferred, a 60% chance of 0 tokens being transferred, and no chance of an intermediate amount being transferred). Likewise, the computer will independently decide using the probability 70% whether 0 or 10 wealth tokens are transferred to you from member 3. If a theft is successful, the wealth tokens are deducted from 2's and/or 3's accumulation and are added to yours.

Exception: If the total number of wealth tokens that other members would successfully steal from a particular group member, say member 2, exceeds 2's existing accumulation, then the computer will adjust the size of the transfers, since member 2 cannot end up with a negative number of wealth tokens. For example, suppose that members 0, 1, 3 and 4 each direct 3 effort tokens to attempting to steal from member 2, and that none of the theft attempts is prevented by the action of 2's degree of protection, so that a total of  $3 \times 10 \times 4 = 120$  wealth tokens would be taken from member 2. And suppose that member 2 has only 100 wealth tokens at this point. Then members 0, 1, 3 and 4 would each receive only  $100 / 4 = 25$  rather than 30 wealth tokens. The decision of each to direct 3 effort tokens against member 2 is nevertheless irrevocable; each would have spent 3 effort tokens, though gaining only 25 rather than 30 wealth tokens from it.

At the end of each round, the total number of wealth tokens will be computed according to the following formula:

$$\begin{aligned} \text{Wealth tokens} = & \text{Wealth tokens held at the beginning of the round} \\ & + \text{New wealth tokens produced} \end{aligned}$$

- + Wealth tokens you stole from other members
- Wealth tokens other members stole from you

At the end of each round you will learn the statistics of your performance in that round as well as the cumulative statistics through that round. That is, you will find out: (i) the number of wealth tokens produced; (ii) the total number of wealth tokens you sought to steal from others and the number of wealth tokens that you successfully stole; (iii) the number of wealth tokens other group members sought to steal from you and the number of wealth tokens they successfully stole. (Note that the information on (iii) is given as an aggregate; you won't be told which particular group members attempted or succeeded to steal from you.) These amounts will be added/subtracted from the number of wealth tokens that you started the round with, according to the formula described above.

You will also learn about the total accumulation of wealth tokens in the hands of each other group member through that round, and the number of wealth tokens that each group member has thus far obtained by production, the number each has thus far obtained by stealing from others, and the number each has thus far lost by means of theft. This information will be available to you anytime in the following round as you make your allocation decisions.

### **Payoffs**

Your earnings from this experiment will be the \$5 that is guaranteed to you simply for participating, plus 1.4¢ for every wealth token that you have accumulated by the end of the 24 rounds. Notice that your earnings do not depend on how much you accumulate in comparison to others, only on how much you accumulate.

To make sure that you understand how collective and private protection work in the experiment, we'll now provide some examples.

### **Examples of protection possibilities**

Example 1: Three members each contribute two effort tokens and two members each contribute three effort tokens to collective protection, for a total of 12, giving a protection level of 72% to everyone. Nothing is spent on private protection, so every member equally enjoys a 72% level of protection.

Example 2: No member contributes any effort tokens to collective protection. Each member uses three effort tokens for private protection. They each achieve a security level of 30%.

Example 3: Two members each contribute two effort tokens to collective protection, while the other members contribute three, one, and zero effort tokens, respectively. In total, 8 effort tokens are contributed to collective protection, which provides a security level of 48% to everyone. Members individually use various numbers of effort tokens for private protection; for example 6 tokens, 4 tokens, 3 tokens, 1 token, and no tokens. They achieve the corresponding levels of security: 100%, 88%, 78%, 58% and 48%, respectively.

### **Examples of the use of effort tokens and payoffs**

Example 1: You begin with 100 wealth tokens and each round you use all 10 effort tokens to produce wealth tokens. No one ever contributes to collective protection. No group member ever attempts to steal wealth tokens from you. You earn 70 wealth tokens each round, accumulating a total of  $100 + (70 \times 24) = 1780$  wealth tokens. Your earnings in dollars would be  $\$5 + (1.4¢ \times 1780) = \$29.92$

Example 2: You begin with 100 wealth tokens and each round you allocate 2 effort tokens to private protection and 8 effort tokens to stealing from others. No one ever contributes to collective protection. You can steal up to 80 wealth tokens, and there is an 80% ( $= 100 - (2 \times 10)$ ) chance that any given attempt by others to steal wealth tokens from you will succeed. Your maximum accumulation could be  $100 + (80 \times 24) = 2020$  wealth tokens, but you may earn less than this, possibly much less, if others successfully steal wealth tokens from you and/or if others use effort

tokens to provide some security for their accumulations. Using the maximum estimate of 2020 wealth tokens, your accumulated earnings in dollars would be  $\$5 + (1.4¢ \times 2020) = \$33.28$

Example 3: You begin with 100 wealth tokens and each round you and others in your group use four effort tokens for production, two effort tokens for private protection, and four effort tokens for stealing, assigning one token to stealing from each other group member. No one ever contributes to collective protection. You produce 48 wealth tokens, and your protection level each period is 20%. The other members of your group each attempt to steal 10 wealth tokens from you and succeed in 80% of attempts, hence reducing your wealth token accumulation by  $4 \times 10 \times 0.8 = 32$  wealth tokens per period, on average. Your four attempts to steal 10 wealth tokens from other members succeed on 80% of attempts, thus adding  $4 \times 10 \times 0.8 = 32$  wealth tokens to your accumulation per period, on average. Your wealth token accumulation thus rises by an average total of 48 per period, earning you a total of  $100 + (48 \times 24) = 1252$  wealth tokens, for earnings of  $\$5 + (1.4¢ \times 1252) = \$22.53$

Example 4: You begin with 100 wealth tokens and each round you put 3 effort tokens into collective protection and assign the remaining 7 effort tokens to production. Suppose other members also put 3 effort tokens into collective protection each period. With  $3 \times 5 = 15$  tokens in collective protection, the likelihood that a theft attempt will succeed is  $100 - (12 \times 6) = 100 - 72 = 28\%$ . Your 7 effort tokens produce 64 wealth tokens for you each round. You can accumulate up to  $100 + (64 \times 24) = 1636$  wealth tokens, but you may earn less if others attempt to steal tokens from you, although in this case they have a 28% chance of success each time (versus the 80% chance of success in the previous example). Using the maximum estimate of 1636 wealth tokens, your total earnings would be  $\$5 + (1.4¢ \times 1636) = \$27.90$

Note that the behavior does not change across rounds in these examples, but this is just for the sake of making these illustrations easy to understand. In fact, your strategy can change over time. As can be seen, there are an almost infinite number of possible outcomes, depending on your decisions and the decisions of others in your group.

After questions are answered and we go through two practice rounds that don't affect your earnings, you will engage in the first four periods of the experiment.

Any questions?

### Practice Scripts

Before the real decision-making begins, we're going to go through two practice rounds the purpose of which is to familiarize you with the way that you enter your choices on your computer screen, the order of choice, and the information you get back after each decision. The earnings shown on your screen for these practice rounds are only illustrative, reflecting decisions I'll be asking you to enter. They have no effect on your real earnings in the experiment. Also, the participants with whom you'll interact in the practice rounds are not the ones in your group for the real decision periods. Please follow our instructions as closely as possible and do not click any buttons until told to.

The first screen you'll see tells you that you and each other person in your group has 100 wealth tokens at the beginning of the experiment. Please click next.

The next screen you'll see in each round tells you the number of wealth tokens and the number of effort tokens with which you begin the round. Please click next.

The next screen is the first in which you have to enter a decision. You should enter the number of effort tokens you want to contribute to collective protection under the heading "Put in Collective Protection."

In this first practice round, please allocate the following number of effort tokens to the group account if the last digit of your seat number is

- even and  $< 6$ : 1 effort token
- odd and  $< 6$ : 2 effort tokens
- even and  $> 5$ : 3 effort tokens
- odd and  $> 5$ : 4 effort tokens

Notice that in the lower part of the window you can see the number of effort tokens that remain in your account, which automatically updates as you enter your contribution into collective protection. Now click Submit. Note that if all participants haven't yet made their decisions and clicked submit, you'll see a screen saying "Waiting for Others". There is no possibility of seeing what others decide first and then making your own decision.

The next screen shows the total number of effort tokens all group members have contributed to collective protection and the consequent level of collective protection. Click continue.

The next screen you'll see is the decision screen for allocating the remainder of your effort tokens for this period. Notice that the number of effort tokens you have left appears in the top of the window, and this number is updated as you allocate these effort tokens to production, private protection and theft. You have to click on at least some of the boxes below the lines saying "production tokens," "private protection tokens" and "theft tokens", until you finish allocating your effort tokens.

Please use your remaining effort tokens as follows (and do not click submit until we tell you to):

- Assign 3 effort tokens to production and 3 to private protection.
- If you still have any effort tokens left, use them to try stealing from other group members.
- Assign no more than one effort token to stealing from an individual and if you have multiple effort tokens assign them randomly, for instance if you have 2, assign them to any two decision-makers in your group.

Before leaving this screen, please notice the following: (a) you can click on the button labeled "Stats" at the top to learn the number of wealth tokens held by the others in your group; (b) when you enter a number of production tokens, you'll see immediately below that box the number of Wealth tokens you'll produce if you stick with that choice; (c) when you enter a number of private protection tokens, you'll see below that box the total level of security of your wealth token accumulation.

Before clicking on the submit button, please also notice that it is possible to reconsider and to change your allocations at any time until you hit submit. Simply delete any entry you want to change and enter a new value. Also note that you don't need to enter a value into each box. If you enter no value under production tokens, for instance, the computer will understand your production tokens choice to be 0. The same applies to private protection and theft tokens. You can always choose 0 in any case. If the number of effort tokens you use for the round does not sum to 10 in total, you will receive an error message and will have to change entries until all of your effort tokens have been used. If you are ready, click on Submit now.

When everyone has submitted their decisions you'll see a "Round Performance Summary." Please read it and raise your hand if you have any questions about this screen. When you're done, please click on Next.

The next screen gives you information about the wealth token accumulations of each member in your group. Notice that there are two boxes: (1) the upper box shows the accumulations of each group member broken up into gains and losses through production and theft *through* the period that just ended; (2) the lower box shows the accumulations of each group member broken up into gains and losses through production and theft *in* the period that just ended. Please click on Next Round.

We'll now run through a second and final practice round. Remember, the practice rounds do not count towards determining your earnings. Again, please follow our instructions for this one last practice round.

Notice that your first screen of the round tells you your updated accumulation of wealth tokens. Note that you begin every round with the same number of effort tokens, 10. Please click next.

Again, the next screen is for indicating how many effort tokens you want to put in the group account. Notice that you can also click on the Stats button here to view again the accumulations of each group member and the breakdown according to production, gains from theft and losses due to theft. If you want the stats to disappear, you can click Hide, otherwise they will go away automatically when you click submit, but you can view them again at the next decision stage.

For this last practice round, please allocate the following number of effort tokens to collective protection if the last digit of your seat number is

- even and  $< 6$ : 4 effort token
- odd and  $< 6$ : 3 effort tokens
- even and  $> 5$ : 2 effort tokens
- odd and  $> 5$ : 1 effort tokens

Now click Submit.

At the second allocation screen, please allocate your effort tokens as follows:

- 3 to production,
- 1 to private protection, and
- For your theft choices, please open again the Stats window. In the real experiment, you may want to use the information in that window to help you decide whom you try to steal from. For this practice round, as an illustration, please assign 2 effort tokens to whichever member of your group (excluding yourself) has the smallest accumulation of wealth tokens after Practice 1 (check the stats window). If more than one member is tied for smallest accumulation, choose one randomly to assign your effort tokens to. If you have more effort tokens left, assign 1 token to whichever member of your group has the 2<sup>nd</sup> smallest accumulation of wealth tokens. If you have more effort tokens left, assign them as you will among the other group members you haven't tried to steal from yet.

When everyone has submitted their decisions you'll see the Round Performance Summary, as before. When you're ready, please click on Next.

Finally, as before, the next screen gives you information about the wealth token accumulations of each group member broken up into gains and losses through production and theft.

Before we begin the rounds that count toward your real earnings, please note that the time it will take to complete all 24 rounds depends on all of your rates of progress. No individual can move forward until all participants make the corresponding decisions at each stage of the process, which includes, at the end of each period, that you finish viewing your round performance summary and click "next." Please focus on the task and click the appropriate "submit" and "next" buttons as soon as you are ready to do so, so that the process can proceed for all in a timely fashion. To help make sure that we finish before \_\_ \_\_ \_\_, we'll remind you to continue if we see that progress stalls. (We can track on our monitor whether actions have been taken but not which actions they were, that information is stored only for later analysis.)


O.k.? Please begin.

## E.3 VOTE

### Instructions

#### General Information

This is an experiment aimed at studying decision-making while interacting with other individuals. During the

experiment, you will be earning money in the form of wealth tokens . At the end of the experiment you will be paid in cash in real dollars (1 wealth token = 1.4¢). The amount you will earn will depend on your and others' decisions. Please read and listen carefully to make sure you understand the decision process. At the end of the instructions you will have a chance to ask questions. The experiment will conclude with a brief questionnaire.

#### Experiment Structure

The experiment consists of 24 rounds, organized in 6 sets of 4 rounds. The initial instructions cover the first 4 rounds, which will be followed by further instructions and the remaining 5 sets of 4 rounds. (The first rounds are labeled 1 – 4, the remaining ones are labeled 1 – 20.) In total, we expect the experiment to last no more than two hours, including the instructions and practice rounds.

#### Your Group

At the beginning of the experiment you will be randomly assigned to a group consisting of yourself and four others. Each member of the group will be randomly assigned a subject number (denoted Sub 0, Sub 1,..., Sub 4) which remains fixed. You will interact exclusively with the people in your group of five throughout the entire experiment. All decisions are made anonymously, so no participant knows the identities of the other decision-makers, nor will you ever be informed who was in your group. Payments are anonymous and will be made in cash at the end of the session.

#### Communication and questions



Communication is not allowed at any time during the experiment. If you have any questions, please raise your hand and we will come to assist you. Do not hesitate to call on us.

#### Other kinds of tokens

During the experiment, you will have the chance to use two types of tokens. Only wealth tokens will be converted into cash at the end of the experiment. Effort tokens will also play a part, but they only have value insofar as they help you to earn or to conserve wealth tokens.


### Instructions

At the beginning of the first round, each member of the group (yourself included) will be endowed with 100 wealth



tokens . Each round, each of you will receive 10 effort tokens . Effort tokens have no money value, but they can be used to help you earn or conserve wealth tokens.

In every round, you have to allocate your effort tokens among three alternatives:

# Effort Tokens	# Wealth Tokens Produced
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- ❖ Produce new wealth tokens . The table on the right shows the relation between effort tokens (the input) and wealth tokens (the output). For instance, if you allocate 5 effort tokens to production, you produce 55 wealth tokens which are added to your accumulation.

1	15
2	28
3	39
4	48
5	55
6	60
7	64
8	67
9	69
10	70

- ❖ Steal others' wealth tokens . You can assign effort tokens to stealing from any other member(s) of the group, such that for every effort token you direct to stealing from, say, member 2, you will have the chance to steal 10 wealth tokens from him/her. The likelihood that your theft attempts succeed depends upon the other member's total degree of security, as described below.
- ❖ Protect your own wealth tokens from being stolen . For every effort token you assign to protection, the probability that you will keep your wealth tokens in the event that someone attempts to steal them rises by 10 percentage points. For example, if you put 4 effort tokens into protection, the likelihood that an attempt to steal wealth tokens from you will fail becomes  $4 \times 10 = 40\%$  (in other words, the likelihood that the attempted theft succeeds is only 60%). The example below illustrates the stealing mechanism as well as the determination of chances.

Example: Member 2 puts 3 effort tokens into protection and member 3 puts 1 effort token into protection. Hence, member 2's degree of protection is  $3 \times 10 = 30\%$ , while 3's level of protection is  $1 \times 10 = 10\%$ . If you direct 2 effort tokens to an attempt to steal from member 2 and 1 effort token to attempting to steal from member 3, 20 of 2's wealth tokens and/or 10 of 3's wealth tokens may be transferred to you. The likelihood of your theft from 2 succeeding is  $100 - 30 = 70\%$ , and the likelihood of your theft from 3 succeeding is  $100 - 10 = 90\%$ . The computer will ultimately determine according to the aforementioned probability of 70% whether 0 or 20 wealth tokens are transferred to you from member 2 (note: there's a 70% chance of 20 tokens being transferred, a 30% chance of 0 tokens being transferred, and no chance of an intermediate amount being transferred). Likewise, the computer will independently decide using the probability 90% whether 0 or 10 wealth tokens are transferred to you from member 3. If a theft is successful, the wealth tokens are deducted from 2's and/or 3's accumulation and are added to yours.

Exception: If the total number of wealth tokens that other members would successfully steal from a particular group member, say member 2, exceeds 2's existing accumulation, then the computer will adjust the size of the transfers, since member 2 cannot end up with a negative number of wealth tokens. For example, suppose members 0, 1, 3 and 4 each direct 3 effort tokens to attempting to steal from Member 2, and that none of the theft attempts is prevented by the action of Member 2's degree of protection, so that a total of  $3 \times 10 \times 4 = 120$  wealth tokens would be taken from member 2. And suppose that member 2 has only 100 wealth tokens at this point. Then members 0, 1, 3 and 4 would each receive only  $100 / 4 = 25$  rather than 30 wealth tokens. The decision of each to direct 3 effort tokens against member 2 is nevertheless irrevocable; each would have spent 3 effort tokens, though gaining only 25 rather than 30 wealth tokens from it.

At the end of each round, the total number of wealth tokens will be computed according to the following formula:

$$\text{Wealth tokens} = \text{Wealth tokens held at the beginning of the round}$$



- + New wealth tokens produced
- + Wealth tokens you stole from other members
- Wealth tokens other members stole from you

At the end of each round you will learn the statistics of your performance in that round as well as the cumulative statistics through that round. That is, you will find out: (i) the number of wealth tokens produced; (ii) the total number of wealth tokens you sought to steal from others and the number of wealth tokens that you successfully stole; (iii) the number of wealth tokens other group members sought to steal from you and the number of wealth tokens they successfully stole. (Note that the information on (iii) is given as an aggregate; you won't be told which particular group members attempted or succeeded to steal from you.) These amounts will be added/subtracted from the number of wealth tokens that you started the round with, according to the formula described above.

You will also learn about the total accumulation of wealth tokens in the hands of each other group member through that round, and the number of wealth tokens that each group member has thus far obtained by production, the number each has thus far obtained by stealing from others, and the number each has thus far lost by means of theft. This information will be available to you anytime in the following round as you make your allocation decisions.

### **Payoffs**

Your earnings from this experiment will be the \$5 that is guaranteed to you simply for participating, plus 1.4¢ for every wealth token that you have accumulated by the end of the 24 rounds. Notice that your earnings do not depend on how much you accumulate in comparison to others, only on how much you accumulate.

To make sure that you understand how the different choices operate in the experiment, we'll now provide some examples.

### **Examples of protection possibilities**

Example 1: Member 1 allocates 5 effort tokens to protection, member 2 allocates 3 effort tokens to protection, and members 3, 4 and 5 each use 1 effort token for protection. Their corresponding levels of security are 50%, 30%, 10%, 10% and 10%, respectively.

Example 2: Group members use various numbers of effort tokens for protection; for example 6 tokens, 4 tokens, 3 tokens, 1 token, and no tokens. They achieve the corresponding levels of security: 60%, 40%, 30%, 10% and 0%, respectively.

### **Examples of the use of effort tokens and payoffs**

In the following examples, we illustrate possible behaviors and the earnings these behaviors would lead to if followed for the entire 24 rounds of the experiment. While the set of decisions to be made will change in some respects after the first 4 rounds, enough remains the same so that calculating payoffs on a 24 round basis is a useful way for you to grasp the earnings consequences of a given scenario.

Example 1: You begin with 100 wealth tokens and each round you use all 10 effort tokens to produce wealth tokens. No group member ever attempts to steal wealth tokens from you. You earn 70 wealth tokens each round, accumulating a total of  $100 + (70 \times 24) = 1780$  wealth tokens. Your earnings in dollars would be  $\$5 + (1.4¢ \times 1780) = \$29.92$

Example 2: You begin with 100 wealth tokens and each round you allocate 2 effort tokens to protection and 8 effort tokens to stealing from others. You can steal up to 80 wealth tokens, and there is an 80% ( $= 100 - (2 \times 10)$ ) chance that any given attempt by others to steal wealth tokens from you will succeed. Your maximum accumulation could be  $100 + (80 \times 24) = 2020$  wealth tokens, but you may earn less than this, possibly much less, if others successfully

steal wealth tokens from you and/or if others use effort tokens to provide some security for their accumulations. Using the maximum estimate of 2020 wealth tokens, your accumulated earnings in dollars would be  $\$5 + (1.4¢ \times 2020) = \$33.28$

Example 3: You begin with 100 wealth tokens and each round you and others in your group use four effort tokens for production, two effort tokens for protection, and four effort tokens for stealing, assigning one token to stealing from each other group member. You produce 48 wealth tokens, and your protection level each period is 20%. The other members of your group each attempt to steal 10 wealth tokens from you and succeed in 80% of attempts, hence reducing your wealth token accumulation by  $4 \times 10 \times 0.8 = 32$  wealth tokens per period, on average. Your four attempts to steal 10 wealth tokens from other members succeed on 80% of attempts, thus adding  $4 \times 10 \times 0.8 = 32$  wealth tokens to your accumulation per period, on average. Your wealth token accumulation thus rises by an average total of 48 per period, earning you a total of  $100 + (48 \times 24) = 1252$  wealth tokens, for earnings of  $\$5 + (1.4¢ \times 1252) = \$22.53$

Example 4: You begin with 100 wealth tokens and each round you put 3 effort tokens into protection and assign the remaining 7 effort tokens to production. Suppose other members also put 3 effort tokens into protection each period. The likelihood that a theft attempt will succeed is  $100 - (10 \times 3) = 70\%$ . Your 7 effort tokens produce 64 wealth tokens for you each round. You can accumulate up to  $100 + (64 \times 24) = 1636$  wealth tokens, but you may earn less if others steal tokens from you. Using the maximum estimate of 1636 wealth tokens, your total earnings would be  $\$5 + (1.4¢ \times 1636) = \$27.90$





Note that the behavior does not change across rounds in these examples, but this is just for the sake of making these illustrations easy to understand. In fact, your strategy can change over time. As can be seen, there are an almost infinite number of possible outcomes, depending on your decisions and the decisions of others in your group.

After questions are answered and we go through two practice rounds that don't affect your earnings, you will engage in the first four periods of the experiment.

Any questions?

### Instructions for the remaining 20 rounds

The following are the additional instructions that you will need for the remaining 20 rounds of the experiment. You will continue to interact with the same group of participants that you interacted with during the first 4 rounds. As before, you will not be identified to one another other than by the subject number, either during or after the experiment, and there must be no communication.

During the remaining rounds, you continue to receive 10 effort tokens  at the beginning of each round, which you can use to produce  more wealth tokens, to steal  others' wealth tokens, or to protect  your wealth tokens from being stolen by others. The computer has recorded your wealth token accumulation so far and will count it towards your final earnings. However, each of you will begin the remaining rounds with a fresh allotment of 100 wealth tokens and you will be shown your earnings in the remainder of the experiment accumulating from this new starting point.

In addition to the three uses of effort tokens that are already familiar to you, there is now an additional way in which effort tokens can be used, called collective protection . Collective protection differs from the private protection activity that has been available until now in three ways. First, an effort token allocated to collective protection increases the security of the wealth accumulations of all members of the group, not only that of the person who allocated it. Second, an effort token allocated to collective protection reduces the probability of a successful theft by 6%, not the 10% associated with private protection tokens (but note that this 6% affects all five group members whereas the 10% impact of a token allocated to private protection affects only one group member—you). Third, allocation of tokens to collective protection takes place in a separate, initial stage of the round, and the total level of collective protection is known to all group members when they make their allocation decisions regarding the remaining three activities (production, stealing, and private protection), whereas the level of an individual's private protection is not known to others when they make those decisions.

A further detail about collective protection is that there is a maximum achievable level of collective protection that is reached if group members put a total of 12 or more tokens into this activity. That is, 72% ( $6\% \times 12$ ) is the largest amount by which the probability of successful theft can be reduced by collective protection. If group members allocate 13 or more effort tokens to collective protection, the protection level remains at 72% (an attempt at theft succeeds with 28% probability). However, allocations to private protection add to the total protection level of an individual. For example, suppose that 7 tokens are allocated to collective protection, giving a protection level of  $6\% \times 7 = 42\%$ . If you then allocate 4 tokens to private protection, your own protection level is  $42\% + (10\% \times 4) = 82\%$ . Of course, your level of protection from theft cannot exceed 100%, so at some point additional tokens allocated to private protection have no effect. For example, if the collective protection level is 72% and you allocate 4 tokens to private protection, the third of your 4 tokens brings your protection level to 100% and the fourth produces no further change.

Although allocations to collective protection always take place in a distinct first stage of each round, there are two different ways in which the allocation decisions can be made. At the beginning of each set of 4 rounds, your group decides by majority vote which of these two schemes will be used in those rounds.

- Scheme 1 (Decide Individually): at the start of every round, each group member decides independently how many of her/his 10 effort tokens to contribute to collective protection.
- Scheme 2 (Decide by Vote): at the start of every round, each group member votes for a number of effort tokens s/he would like all five group members to be required to put into collective protection. The choices of the five of you will be ordered from lowest to highest, and the amount that lies in the middle will be

selected. That amount will then be deducted automatically from the ten effort tokens with which each member begins the round.

Once the choice between Schemes 1 and 2 has been made by majority vote in your group, it will be in force for the next four periods of the experiment, after which your group will vote again on the scheme that will be used to define the individual contributions to collective protection for the subsequent four rounds.

Whereas votes on schemes take place before each set of four rounds, each round itself consists of two stages. In stage 1, each group member either makes her/his contribution to collective protection (if Scheme 1 is in place), or votes for a contribution amount and has the amount decided on deducted automatically (if Scheme 2 is in place). In stage 2, each group member has to allocate her/his remaining effort tokens among the three remaining alternatives of private protection, production and theft. The impact of tokens allocated to each of those three activities remains exactly as in the first four rounds.

To make sure that you understand how collective and private protection work in the experiment, we'll now provide some examples beginning with Scheme 1 (Decide Individually).

### **Examples with individual choice of collective protection (Scheme 1)**

Example 1. Three members each contribute two effort tokens and two members each contribute three effort tokens to collective protection, for a total of 12, giving a protection level of 72% to everyone. Nothing is spent on private protection, so every member equally enjoys a 72% level of protection.

Example 2. No member contributes any effort tokens to collective protection. Each member uses three effort tokens for private protection. They each achieve a security level of 30%.

Example 3: Two members each contribute two effort tokens to collective protection, while the other members each contribute three, one, and zero effort tokens, respectively. In total, 8 effort tokens are contributed to collective protection, which provides a security level of 48% to everyone. Members individually use various numbers of effort tokens for private protection; for example 6 tokens, 4 tokens, 3 tokens, 1 token, and no tokens. They achieve the corresponding levels of security: 100%, 88%, 78%, 58% and 48%, respectively.

### **Examples with voted choice of collective protection (Scheme 2)**

Example 1: Subject 0 votes to require that 4 effort tokens be contributed to collective protection; subject 1 votes for 2; subject 2 for 3; subject 3 for 0 and subject 4 for 1. From lowest to highest, we arrange the amounts for which subjects voted as: 0, 1, 2, 3, 4. The amount that lies in the middle is 2. Therefore, every group member will have 2 effort tokens deducted from her/his endowment of 10 effort tokens and assigned to collective protection. The level of collective protection from the  $2 \times 5 = 10$  tokens is calculated as before, i.e.,  $10 \times 6\% = 60\%$ . Nothing is spent on private protection, so every member equally enjoys a 60% level of protection.

Example 2: Subject 0 votes for requiring 3 effort tokens to be contributed to collective protection; subject 1 votes for 1; subject 2 for 0; subject 3 for 1 and subject 4 for 2. From lowest to highest, we arrange the proposals as follows: 0, 1, 1, 2, 3. Although there are two votes for 1, one of these counts as the middle proposal. Therefore, every group member is obligated to contribute 1 effort token to collective protection, so there is an automatic deduction of 1 effort token from each individual's endowment of 10 effort tokens. The 5 tokens put into collective protection yield a collective protection level of  $5 \times 6\% = 30\%$ . Members individually use various amounts of effort tokens for private protection; for example 6 tokens, 4 tokens, 3 tokens, 1 token, and no tokens. They achieve the corresponding levels of security: 90%, 70%, 60%, 40% and 30%, respectively.

Other examples on the determination of contributions to collective protection under Scheme 2:

Votes are for 0, 0, 0, 2, 3 Decision: everyone contributes 0

Votes are for 0, 1, 2, 3, 3 Decision: everyone contributes 2

Votes are for 0, 1, 3, 4, 5 Decision: everyone contributes 3

Votes are for 0, 3, 4, 4, 7 Decision: everyone contributes 4

Examples illustrating how the full set of decisions can lead to different overall earnings in the experiment were given in the previous instructions. Are there any questions before we begin the practice rounds?

## Practice Scripts

### Practice for first 4 rounds

Before the first real set of 4 rounds begins, we're going to go through two practice rounds the purpose of which is to familiarize you with the way that you enter your choices on your computer screen, the order of choice, and the information you get back after each decision. The earnings shown on your screen for these practice rounds are only illustrative, reflecting decisions I'll be asking you to enter. They have no effect on your real earnings in the experiment. Also, the participants with whom you'll interact in the practice rounds are not the ones in your group for the real decision periods. Please follow our instructions as closely as possible and do not click any buttons until told to.

The first screen you'll see tells you that you and each other person in your group has 100 wealth tokens at the beginning of the experiment. Please click next.

The next screen you'll see in each round tells you the number of wealth tokens and the number of effort tokens with which you begin the round. Please click next.

The next screen is where you have to enter your allocation choices to production, protection and theft. You have to click on at least some of the boxes below the lines saying "production tokens," "protection tokens" and "theft tokens", until you finish allocating all your effort tokens.

Please use your effort tokens as follows (and do not click submit until we tell you to):

- Assign 5 effort tokens to the production of new wealth tokens and 3 to the protection of your existing wealth tokens.
- Randomly assign your remaining 2 effort tokens to stealing from other members of your group.

Before leaving this screen, please notice the following: (a) you can click on the button labeled "Stats" at the top to learn the number of wealth tokens held by the others in your group; (b) when you enter a number of production tokens, you'll see immediately below that box the number of Wealth tokens you'll produce if you stick with that choice; (c) when you enter a number of protection tokens, you'll see below that box the total level of security of your wealth token accumulation.

Before clicking on the submit button, please also notice that it is possible to reconsider and to change your allocations at any time until you hit submit. Simply delete any entry you want to change and enter a new value. Also note that you don't need to enter a value into each box. If you enter no value under production tokens, for instance, the computer will understand your production tokens choice to be 0. The same applies to protection and theft tokens. You can always choose 0 in any case. If the number of effort tokens you use for the round does not sum to 10 in total, you will receive an error message and will have to change entries until all of your effort tokens have been used. If you are ready, click on Submit now.

Note that if all participants haven't yet made their decisions and clicked submit, you'll see a screen saying "Waiting for Others". There is no possibility of seeing what others decide first and then making your own decision.

When everyone has submitted their decisions you'll see a "Round Performance Summary." Please read it and raise your hand if you have any questions about this screen. When you're done, please click on Next.

The next screen gives you information about the wealth token accumulations of each member in your group. Notice that there are two boxes: (1) the upper box shows the accumulations of each group member broken up into gains and losses through production and theft *through* the period that just ended; (2) the lower box shows the accumulations of each group member broken up into gains and losses through production and theft *in* the period that just ended. Please click on Next Round.

We'll now run through a second practice round, which will be the last before the first real rounds begin. Remember, the practice rounds do not count towards determining your earnings. Again, please follow our instructions for this second practice round.

Notice that your first screen of the round tells you your updated accumulation of wealth tokens. Note that you begin every round with the same number of effort tokens, 10. Please click next.

Again, the next screen is for indicating your allocation choices to production, protection and theft.

Notice that you can also click on the Stats button here to view again the accumulations of each group member and the break-down according to production, gains from theft and losses due to theft. If you want the stats to disappear, you can click Hide, otherwise they will go away automatically when you click submit, but you can view them again at the next decision stage.

At the second allocation screen, please allocate your effort tokens as follows:

- 6 to production,
- 1 to protection, and
- For your theft choices, please open again the Stats window. In the real experiment, you may want to use the information in that window to help you decide whom you try to steal from. For this practice round, as an illustration, please assign 2 effort tokens to whichever member of your group (excluding yourself) has the smallest accumulation of wealth tokens after Practice 1 (check the stats window). If more than one member is tied for smallest accumulation, choose one randomly to assign your effort tokens to. Finally, assign 1 effort token to whichever member of your group has the 2<sup>nd</sup> smallest accumulation of wealth tokens.

When everyone has submitted their decisions you'll see the Round Performance Summary, as before. When you're ready, please click on Next.

Finally, as before, the next screen gives you information about the wealth token accumulations of each group member broken up into gains and losses through production and theft.

Before we begin the rounds that count toward your real earnings, please note that the time it will take to complete all 24 rounds depends on all of your rates of progress. No individual can move forward until all participants make the corresponding decisions at each stage of the process, which includes, at the end of each period, that you finish viewing your round performance summary and click "next." Please focus on the task and click the appropriate "submit" and "next" buttons as soon as you are ready to do so, so that the process can proceed for all in a timely fashion. To help make sure that we finish before \_\_ \_\_, we'll remind you to continue if we see that progress stalls. (We can track on our monitor whether actions have been taken but not which actions they were, that information is stored only for later analysis.)

O.k.? Please begin.

### **Practice Rounds for remaining 20 rounds**

#### **(Practice under independent contribution)**

Before proceeding with the remaining 20 rounds, we're going to go through two practice rounds the purpose of which is to familiarize you with the procedure for voting on which of the two schemes for determining the level of collective protection will be used by your group, as well as to familiarize you with the collective protection technology itself. As before, the earnings shown on your screen for these practice rounds are only illustrative and have no effect on your real earnings in the experiment. Please follow our instructions as closely as possible and do not click any buttons until told to.

The first screen you'll see tells you that you and each other person in your group has 100 wealth tokens at the beginning of the remaining rounds. Please click next.

The next screen you'll see asks you to indicate which of the two schemes under which the level of collective protection can be determined you prefer. For this practice round, please all vote for "Decide individually", whereby each group member decides independently how many effort tokens to contribute to collective protection. Click next.

The next screen shows the result of the vote. Since everyone in the group voted for determining contributions into collective protection independently, this is in fact the scheme that will be used for this practice round.

The next screen you'll see in each round tells you the number of wealth tokens and the number of effort tokens with which you begin the round. Please click next.

The next screen is for indicating how many effort tokens you want to contribute to collective protection. Please allocate the following number of effort tokens to the group account

if the last digit of your seat number is

- even and  $< 6$ : 1 effort token
- odd and  $< 6$ : 2 effort tokens
- even and  $> 5$ : 3 effort tokens
- odd and  $> 5$ : 4 effort tokens

Notice that in the lower part of the window you can see the number of effort tokens that remain in your account, which automatically updates as you enter your contribution into collective protection. Click submit.

The next screen shows the total number of effort tokens all group members have contributed to collective protection and the consequent level of collective protection. Click continue.

The next screen you'll see is the decision screen for allocating the remainder of your effort tokens for this period. Notice that the number of effort tokens you have left appears in the top of the window, and this number is updated as you allocate these effort tokens to production, private protection and theft. You have to click on at least some of the boxes below the lines saying "production tokens," "private protection tokens" and "theft tokens", until you finish allocating your effort tokens.

For purposes of this practice round, please use your remaining effort tokens as follows (and do not click submit until we tell you to):

- Assign 3 effort tokens to production and 3 to private protection.

- If you still have any effort tokens left, use them to try stealing from other group members, distributing them randomly among the other group members.

Before leaving this screen, please notice that when you enter a number of private protection tokens, you'll see below that box the total (i.e., collective protection + private protection) level of security of your Wealth token accumulation. Click on Submit now.

As before, the next two screens provide the "Round Performance" summary and the information about the wealth token accumulations of each member in your group. Please click on Next and Next Round, accordingly.

### **(Practice under voting scheme)**

We'll now have a practice round using the scheme in which the contributions to collective protection are determined by vote.

There is again a first screen telling you that you have an endowment of 100 wealth tokens. This screen will in fact only appear at the beginning of the first of the remaining rounds..

The next screen is again the one in which you vote for one or the other of the two schemes for determining contributions to collective protection. (Recall that you will actually vote on the scheme only at the beginning of each set of four rounds, not in every round. The remaining 20 rounds are renumbered beginning from 1, so the votes are before round 1, round 5, round 9, round 13, and round 17. Here you're voting on the scheme during consecutive rounds in order to get you familiar with both schemes.) Please all vote for "Decide by vote (middle preference binding)" whereby each group member votes for a number of effort tokens he or she would like all five group members to be required to put into collective protection, and the amount that lies in the middle will be selected. Click next.

The next screen shows the result of the vote. Since everyone in the group voted for determining contributions into collective protection by majority vote, this is in fact the scheme that will be used for this practice round.

The next screen you'll see tells you the number of wealth tokens and the number of effort tokens with which you begin the round. Please click next.

In the next screen, you'll put a number into the box under the heading "Enter the number of tokens you wish to have all group members including yourself put into Collective Protection." Please vote for having the following number of effort tokens put into collective protection:

if the last digit of your seat number is

- even and < 6: 4 effort tokens
- odd and < 6: 3 effort tokens
- even and > 5: 2 effort tokens
- odd and > 5: 1 effort token

When everyone has cast their vote, you'll see what the group selected as the number of effort tokens that will be contributed by each group member in the round and the consequent level of collective protection. You will also see the number of effort tokens that remain in your account. Notice that the amount that the group decided on (i.e., the middle number among those selected by the five group members) is automatically deducted from your endowment of 10 effort tokens. Click next.

At the second allocation screen, please enter the following decisions (and do not click submit until we tell you to):

- First, assign 3 effort tokens to production and 1 to private protection.
- Then, allocate the remainder of your effort tokens to theft, assigning them randomly among the other members of your group.



You may now submit the allocation. The next two screens show your performance summary and the accumulation of wealth tokens by each group member. Click Next as you finish looking at this information. This ends our two practice rounds.

Any questions? Please begin.