Preliminary Draft: Please do not cite or quote.

Paying for Property Tax Assessment Quality: An Experiment*

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October 2014

Abstract: At the local government level, the property tax is a major source of funding for public goods. The process by which property taxes are assessed involves establishing a fair market value of the property. In many jurisdictions, tight budgets for tax administration have led to complaints of highly inaccurate valuation of properties. The result may be property taxes that are "too high" or "too low." In this research, a laboratory experiment is conducted to determine the willingness of taxpayers to pay for improved assessment. In this experiment, the choice that is modeled is a reduction in risk, which people value, as predicted by economic theory and confirmed by experimental evidence and the existence of insurance markets. In principle this benefit can be provided as a private good, meaning that an individual pays a private firm to reduce risk and is the sole beneficiary of the risk reduction. An example would be a warranty or collision insurance for an automobile. It might also be provided as a public good, in which a group acts collectively to reduce risk and the group benefits from the reduction in risk. Examples of this kind of collective risk reduction include the establishment and maintenance of fire departments or investments in watershed management. This research will produce new knowledge on the ways in which human behavior responds to these two types of risk reduction, and the similarities and differences between them with a practical application in the case of property tax assessment.

JEL Codes: H7, C91

Keywords: Property Tax Assessment; Experiment

* We benefited from the very competent research assistance provided by Alicia Plemmons. We also thank Kevin Ackaramongkolrotn for his assistance in conducting the experiments. Wallace is an affiliated faculty with the African Tax Institute, University of Pretoria, Republic of South Africa.

Introduction

One of the perennial difficulties with the property tax is accurately determining the market value of taxable property. The common refrain among taxpayers is that the property tax is very inequitable, due in part to the lack of uniformity of property assessments. The International Association of Assessing Officers (IAAO) suggests that for property tax assessments of single-family residential properties the acceptable value of the coefficient of dispersion (COD) is between 5.0 percent and 15.0 percent.[1] Thus, even a very good assessment will have sizable variation in the ratio of appraisal to market value. Sjoquist and Walker (1999) explored variations in assessment quality across Georgia's 159 counties, and found significant variation in the COD across counties. Using these data, they estimated a translog cost function for property tax assessments and find that the cost of assessment is positively related to the quality of the assessment process, as measured by the COD. The estimated elasticity of total dollar value of assessment cost with respect to the COD is 0.132. Their finding implies that a jurisdiction should be able to improve the quality of their assessments by committing more resources to the assessment process.

There are at least two main reasons why a homeowner may be willing to pay for a higher quality assessment process, meaning an assessment process in which the COD is smaller.[2] First, a homeowner might be risk averse and thus willing to pay for a lower variance of the possible assessed values assigned to his home. The amount he would be willing to pay will depend on the cost of reducing the variance in assessed value and how risk averse he is. Second, a homeowner might be concerned with the equity of the assessments. This concern with equity can take two

[1] The COD is a standard descriptive measure of the quality of the assessment process (Gerau and Plourde 1976). The larger the COD, the larger the distribution of assessed values are around the median.

[2] There are other dimensions of the quality of assessment, including the deviation of the mean or median sales-assessment ratio from the legal assessment ratio and how the sales-assessment ratio varies across property value. The latter is usually measured by the price related differential (PRD), which measures the extent to which higher or lower valued properties are over or under assessed on average.

forms. First, the homeowner might be concerned that some owners will pay "too much" in property taxes compared to others, and thus the homeowner would be willing to pay to reduce the inequity in assessments, independent of his own assessment. Second, the homeowner might be concerned that his assessment is high relative to that for other homeowners. For example, a homeowner might be willing to pay to avoid a situation in which his home is assessed at more than his neighbors' houses. There may be other reasons why a taxpayer might be willing to pay to reduce the variance of assessed values. For example, the need to appeal one's tax assessed might be reduced or sales price might reflect the capitalized value of current property taxes. We do not consider these possible effects in the experiments.

We are interested in homeowners' willingness to pay to improve the quality of the assessment process. As far as we can determine, no one has attempted to address this issue, whether through a survey of homeowners, an empirical model, or a laboratory experiment. In this paper, we report the results of a lab experiment that investigates the willingness to pay for improved assessments. We also explore how the willingness to pay for reduced variance in assessments, and thus in property taxes, differs from the willingness to pay for an equivalent reduction in other costs. We also investigate whether the willingness to pay differs between a reduction in the variance of the subject's personal assessment and a reduction in the variance for all taxpayers.

The rest of the paper proceeds as follows. In the next section we discuss our hypotheses, while in the third section we present details of our experiment. The results of the experiment are presented in Section 4. A summary and conclusion section completes the paper.

1. Development of Hypotheses

To consider the willingness to pay for higher quality property tax assessment we conduct a lab experiment in which we consider three scenarios, which are explained in more detail below. In the first scenario, the subject is concerned with paying a private firm to reduce the variance of some potentially large loss. In the second, the subject can pay an additional tax to the government to reduce the variance of the assessment of his home, while in the third, the subject can pay an additional tax to the government to reduce the variance of the assessments of his home and his neighbors' homes. In these two latter cases, the additional tax provides resources to the tax administration that are spent on improved assessment procedures. The first treatment is simply a decision regarding risk taking while the second treatment is a decision regarding risk taking but which involve government and taxes. The third treatment involves contribution to a public good, namely the reduction in variance of the assessments of the neighbors in addition to government and taxes.

There is a substantial literature concerning experiments associated with risk taking (see Holt and Laury (2002) and Dohmen et al (2011) for surveys). We expect that most subjects will be risk averse and thus will be willing to pay to reduce the variance of the loss. In our experiment, we separately identify attitudes toward risk and attitudes toward taxation. The first scenario allows us to establish risk attitudes. The second and third scenarios allow us to explore how one's willingness to pay to reduce the variance of a cost might differ if cost is a tax rather some other payment.

This experiment is somewhat unique in that it involves the interaction of individual choices under risk within the context of taxation and public service provision, as well as a public mechanism for providing this service. Some other studies are related. Einav et al. (2012), for example, examine risk attitudes in insurance decisions and 401(k) allocations, but use choices

occurring in the broader insurance and financial markets. Esarey et al. (2012) examine the case of social insurance and redistribution using median-voter-controlled taxation in a laboratory experiment.

In theory, the decisions in the first and second scenario should be the same given that the cost of reducing the variance of the loss are the same in the two scenarios. However, the second scenario involves taxes so that we can explore whether subjects are more averse to taxes than "private sector" costs. If subjects are tax adverse, we expect that the choices in the second scenario will differ from those in the first scenario. However, we cannot hypothesize that subjects will pay more or less of an additional tax to reduce the variance of property taxes than they would pay a private firm to reduce the variance of a non-tax loss. The reason is that both the payment and benefit in the second scenario are taxes. [We now plan to add a fourth scenario in which the payment to reduce the variance in assessment is made to a private firm.] By comparing the results from the private and public scenarios, we can measure the subjects' tax aversion. In the third scenario, the fact that the decision will reduce the variance of the assessment for the subject's neighbors as well as for the subject might cause the subject to reduce the assessment variance by more than in the second scenario.

Economists often view taxes as simply another cost, so that the reaction to a change in, say, an excise tax should be the same as a change in the price of the produce. For example, early studies of labor supply elasticities used wages net of taxes as the independent variable, implicitly assuming that an increase in taxes would have the same effect on labor supply as a reduction in wage. However, individuals likely view paying taxes as being different than paying another cost; see Hardisty, Johnson, and Weber (2010). For example, sales tax holidays seem to generate more shopping than suggested by price elasticities.

There appears to be little research on aversion to taxes. We identified only two studies and they suggest that we should find a difference in behavior between the private and public scenarios. Sussman and Olivola (2011) explore this possible phenomenon of tax aversion, i.e., that people dislike taxes above and beyond the financial cost of the tax, using a series of surveys. They pose hypothetical scenarios and ask the subjects to choose between two alternatives. In the first two scenarios the subjects were asked to make a choice between two stores at which to buy a television. In the first scenario, the one store was located nearby while the other required a 30 minute drive. Some subjects were told that there is a 9 percent discount at the second store, while other subjects were told that the sale would be tax free, an 8 percent reduction. Sussman and Olivola find that when the tax free situation is the alternative, more subjects choose to drive the longer distance, 76 percent in the tax free situation compared to 59 percent for the 9 percent discount. The second scenario is similar; some subjects were asked how long they would wait in line to get a discount while others were asked how long they would wait to get buy the product tax free. They find that subjects were consistently willing to wait longer in the tax free situation. The third scenario involved a choice of tax-free investment versus a taxable investment. The net return and risk for the two assets were the same. They find that 77 percent of the subjects chose to invest in the tax free asset over the taxable asset. Our experience is somewhat different in that we are investigating whether someone will pay more of one tax to reduce the variance of another tax and there may be a non-symmetric response to tax changes, which has not been investigated in previous research.

Regarding the third scenario, there are two notions of equity that might be at play. First, there is the possibility that subjects are affected by social equity, how well others are treated. Second, there is inequality aversion. Fehr and Schmidt (1999) model fairness as self-centered

inequality aversion, defining inequality aversion as an interest in the fairness of their own payoff relative to others. Bolton and Ockenfels (2000), on the other hand, express inequality aversion as referring to one's own payoff relative to the average of all payoffs. Engelmann and Strobel (2004) conduct experiments to explore these two concepts of inequality aversion, as well as the role of efficiency (as measured by total payoffs), and social preferences, and in particular maximin preference. Engelmann and Strobel's tax experiment suggests that individuals are concerned with their payoff relative to others, and thus support Fehr and Schmidt's concept of inequality aversion, but that decisions over tax structures are also influenced by efficiency and are consistent with maximin social preferences.

There have been experiments in which subjects choose between tax structures. For example, Ackert, Martinez-Vazquez and Rider (2007) conducted an experiment in which they examined the subjects taste for fairness. In the experiment subjects made choices between levels of economic efficiency, as measured by the size of the payoff, and equity. The authors find that some people are willing to accept a smaller payoff in order to reduce payoff inequality, but that the demand for fairness decreases as the cost of reducing inequality increases.

Ackermann, Fochmann, and Mihm (2013) explore how taxes affect financial investment decisions. They run an experiment in which subjects make choices between investing in a risk-free asset and a risky asset, where in some treatments a tax is imposed on the risky asset. In all cases expected the returns to the risky asset net of the tax are the same. They find that when there is a tax imposed on the gross return to the risky asset, a smaller percentage of the investments are made in the risky asset. Their experiment differs from ours in several ways. First, their decision is between assets while ours is a decision regarding the reduction in the variance of an owned asset. In their experiment taxes reduces the returns, while in ours the choice is about the tax to

pay to reduce the variance of another tax. Finally, in their experiment, taxes reduce the return, while in ours the tax provides a benefit in that the variance of the property tax payment is reduced.

In other, somewhat unrelated evidence that individual consider taxes different than other cost, Durham, Manly, and Ritsema (2014) explore whether the context (tax versus non-tax language) affects the extent of tax compliance. In laboratory experiments they find that when a tax context is used, compliance is higher. However, others find no difference in tax compliance related to context (see Kirchler 2007 for a review.)

If the payment of taxes involves a non-monetary cost to the subject, in addition to the taxes, the true cost to the subject from paying a tax will be larger than the actual tax. The effect on choice of payment will depend on the nature of the relationship between the non-monetary cost and the tax. The non-monetary cost could be a flat amount regardless of the tax, or more likely some percentage of the tax, which perhaps increases with the tax amount.

Assuming a selfish homeowner, the decisions in the second and third treatments should be the same. However, the third treatment involves choices to implement mandatory contributions to a public good or positive externality, and we hypothesize that homeowners would be willing to do that. This hypothesis is related to the very large literature on voluntary contributions to public goods (see Isaac and Walker (1988) for a review), but is more closely related to work involving median voter mechanisms (e.g. Esarey et al. 2012). The lab experiments on this topic generally find that individuals are not free riders, but rather voluntarily contribute more to a public good than is implied by economic theory. Our experiment, however, is unique in that the benefit to the other subjects is a reduction in the variance of taxes, not an increase in the level of a public good. We know of no other research that has addressed the issue

of how much would someone be willing to pay to reduce the variance of other subjects' taxes. We do this holding the expected level of property taxes constant. We expect that subjects will be willing to pay more when the variance of assessments is reduced for the neighbors than just for the subject.

Subjects might be willing to pay an additional tax to improve the quality of property assessment because of concerns for tax equity (social equity) or because of concerns with the fairness of their taxes (inequality aversion). Comparing the results of scenarios II and III does not allow us to sort out the difference in the subject's willingness to pay for social equity as opposed to paying for the reduced risk concerning their own tax (inequality aversion), although both of these components are likely behind the behavior we observe in scenario III.

This discussion assumes that the homeowner is concerned only with the current year's assessment. Suppose that the homeowner believes that the distribution of assessments is uniformly distributed around the owner's perceived value of the home, and that the assessment in year $t+1$ is independent of the assessment in year t. In this case the homeowner will expect to pay, on average over time, the property taxes based on his perceived value. In this case, the homeowner may only be concerned with the swings in assessed value from year to year. Our experiment, however, concerns decision in one year, and thus one time property tax payments.

2. **Design of the Experiment**

The experiment involves subjects making a series of decisions.[3] In each decision, they are presented with an endowment, a set of possible losses, and the opportunity to make a costly choice that can influence the set of possible losses. The units used are experimental dollars, and all conversions to earnings are shown to subjects while they are making their decisions.

[3] Full subject instructions are available in Appendix A

In each case, the original set of possible losses includes some mean loss, and then symmetrical increases and decreases at 10 fixed intervals. For example, in one case, the mean might be $3,000, and the interval might be $100, so that possible outcomes include ($2000, $2100, … , $2900, $3000, $3100, ... , $4000). These twenty-one outcomes are equiprobable. The mean and the intervals change from round to round, but the original set always includes 21 possible outcomes.

We introduce three treatments: a Fully Private treatment, a Government Private treatment, and a Government Public Good treatment. In each case, subjects are presented with an opportunity to make a choice to reduce the set of possible losses. The treatments vary somewhat in the choice that subjects face. In the two Private treatments, subjects face a price they can pay to reduce the set of possible losses by removing the most expensive and least expensive losses. If they pay this price once, they can remove the two outlying outcomes. This decreases the range of possible outcomes, and increases the probability of realizing each remaining outcome. They can choose to incur this cost multiple times if they prefer, reducing the range of possible outcomes further. The choice, then, is a choice to pay a particular price to purchase one of a set of lotteries. Note that, while the expected realization does not change, the net realization (inclusive of the cost of the reduction in the range of possible outcomes) is decreasing in expectation as they reduce the riskiness of the lottery.

In the Government Public Good treatment, subjects collectively decide on the price to pay and the lottery to face, using a median-voter mechanism. Subjects are in groups of 5, and each subject chooses their preferred amount of risk reduction to purchase as a group. The median of the 5 choices is implemented, and all subjects in the group pay that price and face that lottery. As previously discussed, subjects in this treatment may face considerations of their own private

risk, attitudes toward taxation, as well as equity concerns. Note that equity in this setting refers to horizontal equity and not vertical equity since the subject is told that all neighbors have the same value home and same income.

The treatments also differ in their framing. The framing of the treatments is as follows:

Fully Private Treatment – The subject makes a decision of how much to pay a firm to take steps that will reduce the range of possible damages on the subjects' hypothetical house. The payment and effect of narrowing the potential damages is shown on the screen using the mouse to move a slider.

Government Private Treatment – The subject chooses how much to pay in additional tax to the government, which is referred to as the Government Information Tax, to provide the government with additional resources to collect more detailed information about your home like the interior space, the age of the home, etc. This information will help the government determine the value of the home and will reduce the range of possible values that might be assigned to the home, and consequently, will reduce the range of possible property taxes that might be levied.

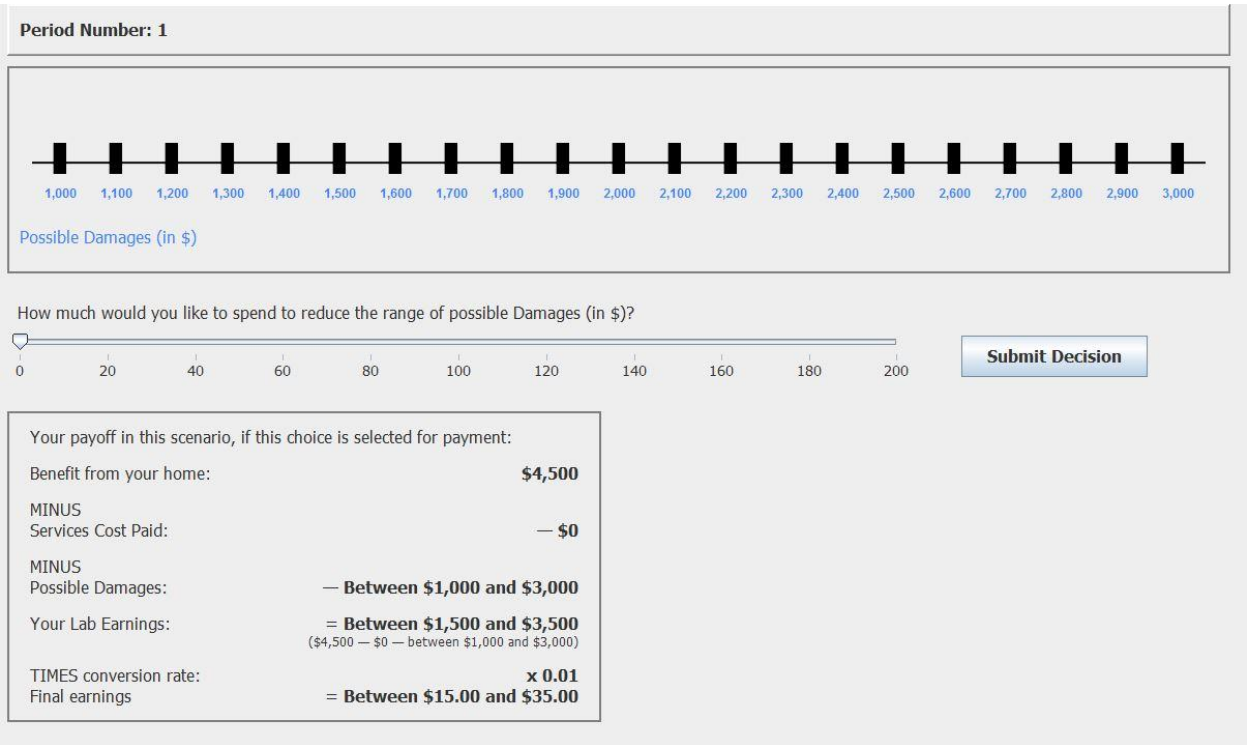
Government Public Good Treatment – The subject can propose an amount that he/she and each of their "neighbors" pay in additional tax to the government, which is referred to as the Government Information Tax, to provide the government with additional resources to collect information about the homes in the neighborhood like the interior space, the age of the home, etc. This information will reduce the range of possible values that might be assigned to each of the 5 homes in the neighborhood. This also reduces the range of possible property taxes they and their neighbors would have to pay.

In each treatment, subjects face 15 such decisions, with 5 sets of parameters that are randomly re-ordered in three sets to check for consistency of choices. For each of the treatments the payments required to reduce the range of damages or taxes were set so that the tradeoff

between lower risk (as measured by the variance) and expected return (as measured by the mean less the payment) was concave. In this setting a subject who is risk neutral or who prefers risk would choose not to pay anything, since that would maximize expected value. For risk averse subjects, this condition theoretically ensures a unique interior utility maximization choice of payment, assuming convex utility functions.

Each subject is placed anonymously into a group with 4 other subjects, then participates in one treatment for 15 rounds. At the end of the first treatment, treatment 2 is introduced and the subjects are are randomly rearranged into new groups with 4 other subject. In this way, subjects make thirty decisions. At the end of these thirty decisions, one is randomly selected for payment from treatment one and one from treatment two, at which point the lottery is realized and their payment is determined.

A screen shot from the experiment highlights the mechanics of the experiment:



3. **Results of the Experiments**

[We expect to have results from a pilot of the experiments by next week. We will send those results as soon as possible.]

The pilot experiments were run at the Andrew Young School's Experimental Lab with student subjects. The actual experiments are designed to last no more than 90 minutes with 30 to 40 subjects per session. Earnings for the experiments averaged XXXX with a minimum of XXXX and a maximum of XXXX.

Findings from pilot…

4. Summary and Conclusions

In this paper we explore the willingness to pay for improved property tax assessments, measured as a reduction in the variance of the possible assessments. To do so, we conducted a series of laboratory experiments. We hypothesize that the willingness to pay for reduced variance of property taxes will differ from the willingness to pay for an equivalent reduction in property loss due to tax aversion and concerns with equity.

The three experiments discussed above address two issues: whether subjects will react differently when a decision involve taxes versus an equal outcome decision not involving taxes; how much will subjects pay to improve property tax assessment. There are several additional experiments that we hope to run that will further explore these two issues. However, we have not fully designed these experiments, but the following discussion provides a detailed outline of these potential additional experiments.

1. As noted above, the Government Private experiment mixes property tax payments and a tax to reduce the range of property tax payments. Thus, to be able to draw a sharper line between the Private experiment and the Government Private experiment, we plan to modify the Government Private experiment by having the subject pay a private firm, rather than the government to reduce the range of property taxes. We refer to this as the Government Private II experiment.
2. A more straightforward test of the role of tax aversion is the following experiment. A subject will be given an initial endowment that can be allocated to consumption, to pay a firm to reduce the subject's taxes, and to pay a firm to reduce damage to the subject's home. We will do two variations of this experiment, the first in which the effects on taxes and damages of the payments to the private firms will be known with certainty, and the second in which the effects will be drawn from a random distribution. The later experiment, combines the Private experiment and the modified Government Private II experiment.
3. The third experiment explore a specific aspect of property tax, namely the ability to appeal one's tax appraisal. This experiment will explore the extent to which the willingness to pay for an appeal for a property tax assessment depends on whether the appraised value is greater than the actual value of the property. The design will follow the design of the first additional experiment in which the outcome of the payment is drawn from a uniform distribution. The cost of reduction in the property tax will decreasing function of the difference between the true value and the appraised value.
4. This experiment will be similar to the third additional experiment except that we will introduce the assessed value of subject's neighbors. Experiments 3 and 4 will allow

us to explore whether the perception of property tax fairness is related to how one's assessment is related to true value or is relative to the assessed value of subject's neighbors' property.

5. This experiment will be similar to the Government experiment, except that the Government Information tax will only change the assessment of the subject's neighbor's property. In addition to reducing the uniform distribution of assessed values, we will allow distributions in which the neighbors' values are too low and too high. This will allow us to explore issues whether willing to pay for tax fairness differs depending on whether fairness involves increasing or decreasing the neighbor's assessed value.
6. The final additional experiment will explore the situation in which the subject knows the current assessed value, has some expectation regarding next year's assessed value, and can pay to increase assessment equality next year. This experiment will be similar to the Government experiment, but is much more complicated in terms of the number of variables that have to be considered. Our conceptualization of this experiment has not progressed very far.

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APPENDIX A: INSTRUCTIONS

General Instructions

Introduction

Welcome and thank you for participating!

Before we begin, please turn off and store all of your electronic devices. Thank you.

This is a study of economic decision making. You have the opportunity to make money in this experiment. The amount of money you can earn today will depend on your decisions, so please read carefully.

Random Group Assignments and Anonymity

Each person will be randomly matched with 4 other people to form a 5-person group. No one will learn the identity of the members of his/her group. After 15 rounds, all the groups will be rearranged and you will be randomly matched in a new group of 5 people (you and 4 others). You will be notified when the groups have been rearranged. In total, you will play in 2 different 5-person groups.

Privacy

As a member of a group you will be completely anonymous. No participant will be able to link your choices to your identity. Please do not reveal your identity to anyone. Do not communicate with the other participants during the experiment.

Payment

Your total payment will consist of a participation fee of $5 and the amount you earn in the course of the experiment. The earnings during the experiment will be in "experimental dollars", which will be converted to U.S. dollars at the rate displayed on your screen. You will be paid in U.S. currency privately at the end of the session.

You will participate in a number of rounds in today's experiment. In each round you will be required to make a decision, and in each round, you will be assigned an INDIVIDUAL FUND in which your earnings for the round will be placed. The decision for a given round will lead to consequences that change the amount of money in your INDIVIDUAL FUND. At the end of the experiment one of the rounds will be randomly chosen as the one that determines your earnings. The experimental dollars in your INDIVIDUAL FUND for that round will be converted to U.S. dollars and combined with your participation fee to determine your payment. You should think very carefully about each decision as you do not know which decision will be chosen for payment. We will discuss the decisions you will be making in a moment.

Time

Today's session will consist of the experiment itself and a brief questionnaire. The whole session should take no more than 2 hours.

Final notes

Please, read all the instructions carefully. You are welcome to ask questions at any point. Just raise your hand and an experimenter will come to assist you in private. Once you have finished reading the instructions please put the instructions face down on your workstation and the experiment will continue as soon as everyone is finished reading the instructions.

Instructions for the Next Set of Rounds **P**

You will now be randomly assigned by the computer into groups of 5 people.

Remember, you will be with the same group of people for 15 rounds.

In each round, you and the other members of your group own homes in a neighborhood. Living in that home generates benefits for you, which can be measured in dollars, and which will be shown to you on the screen. This amount will be deposited into your INDIVIDUAL FUND for the round.

Unfortunately, within each round, an event will occur that will cause damage to your home and you will have to pay to repair those damages. There will be exactly one such event in each round.

For example, the tree in the front yard could fall and do major damage, requiring a very costly repair, or a single limb might fall off the tree and do a small amount of damage, requiring little repair. You expect that it will cost some amount of money to repair the damages in a given round. The actual cost of repairing the damages can fall anywhere within a range of possible values. The range of possible damages for you and your neighbors is identical, although the homes look different, and the damages that occur may differ from one home to the next.

In each round, you will be told the range of possible costs necessary to repair damages to the home.

You can pay a firm to take steps that will reduce the range of possible damages for which you would have to pay for repairs. For example, before any event, the firm might come out to your house and inspect the tree and take steps to ensure that neither it nor a limb will fall, reducing the likelihood of a large damage and a small damage. The more you pay that firm, the greater the reduction in the range of possible damages—that is, the largest and smallest possible damage amounts will be eliminated. This means that the probability of each of the remaining possible damages will increase, as the probabilities must add up to one. Each of the possible damage amounts is equally likely. Note that you can choose not to spend anything on the firm's services and accept the larger range in damages.

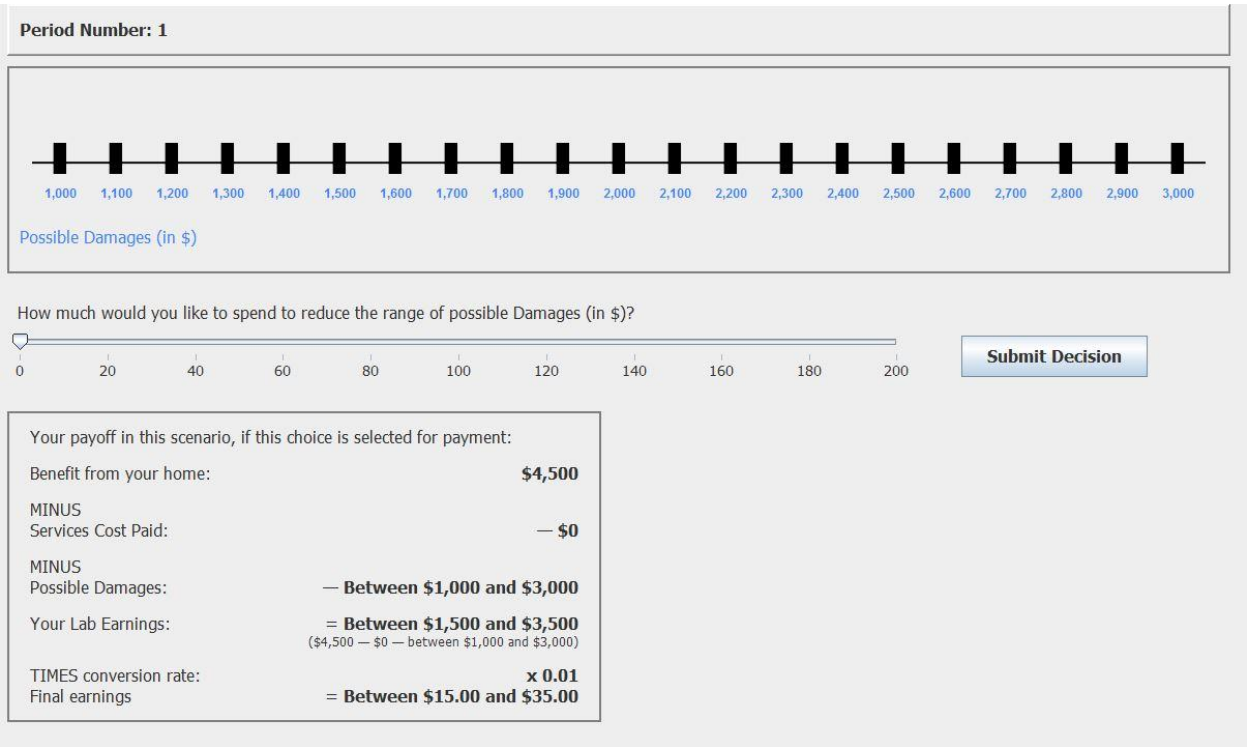
The cost of the firm's services may be different from one round to the next. The cost will always be shown to you on the screen.

At the beginning of each round you will see a range of possible damages and you will see a "slider" that can be moved to indicate how much you will spend to reduce the range of possible

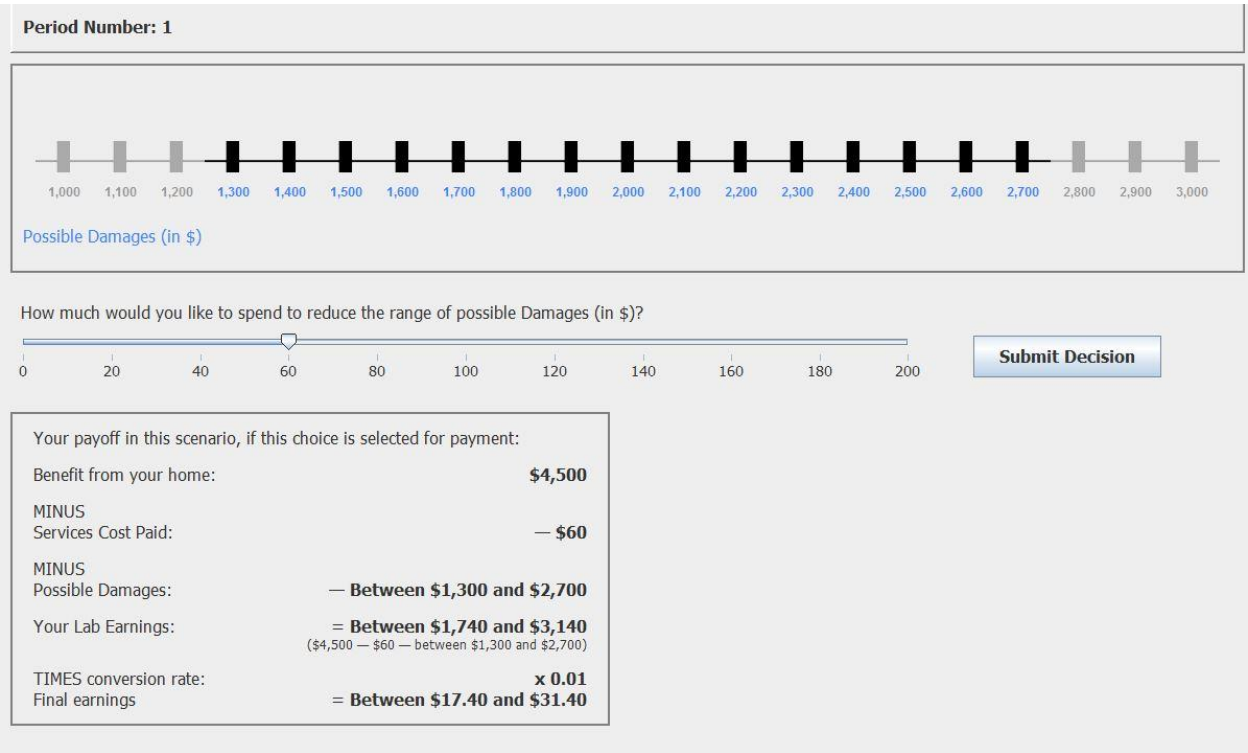
damages. As you move the slider, you will see that the range of possible damages will decrease and the probability of each of the remaining damage amounts will increase. Once you have decided on how much to spend on firm's services, click on the SUBMIT button. The amount you paid for the firm's services, if any, will be subtracted from your INDIVIDUAL FUND.

At that point, one of the possible damages will be selected at random by the computer. There is an equal chance that any of the damages shown on the screen will be selected. The amount shown will be subtracted from your INDIVIDUAL FUND.

Let's consider some examples. The two pictures are examples of what you will see on the screen.



The first picture is an example of the screen you will see at the beginning of the round. The top box shows the range of possible damages. The slider on the bar in the middle can be moved to select the amount you want to pay to reduce the range of possible damages. The box at the bottom summarizes the benefits and costs; the values will change as you move the slider. Once you have determined the amount you want to spend to reduce the range of damages and have set the slider on that amount, clicking the "Submit Decision" box will submit the decision.



In the second picture, the player has moved the slider to $60. This has reduced the range of damages to between $1,300 and $2,700. If the player were to now click the SUBMIT button, one of the values between $1,300 and $2,700 would be selected at random, with equal probability.

To sum up:

- You will be randomly assigned to a group of 5 people.
- You will be with the same group of people for 15 rounds.
- You own a home in a neighborhood.
- That home provides you with a benefit, which will be **added** to your INDIVIDUAL FUND.
- Your home will receive damages. The cost of repairing these damages will be randomly selected from a set of damages and associated cost of repair shown on the screen.
- You can pay a firm to reduce the range of possible damages, or choose not to pay to reduce this range. This payment will be **subtracted** from your INDIVIDUAL FUND.
- Once you have chosen one of the payment options, the damages are randomly selected from the range of possible values and the cost of repairing these damages will be **subtracted** from your INDIVIDUAL FUND.
- At the start of each round your INDIVIDUAL FUND will again be set to zero.

Instructions for the Next Set of Rounds **GP**

You will now be randomly assigned by the computer into groups of 5 people.

Remember, you will be with the same group of people for 15 rounds.

In each round, you and the other members of your group own homes in a neighborhood. The local government provides public services that offer you benefits, which can be measured in dollars, and which will be shown to you on the screen. This amount will be deposited into your INDIVIDUAL FUND for the round.

To pay for these services the government must impose taxes on you and your neighbors. The tax used is a property tax, which works as follows. The government attempts to determine the value of everyone's home. However, valuing homes is not an exact science, and the value that the government sets for your home can fall anywhere within a range of possible values. The range of possible home values for you and your neighbors is identical, although the homes look different, and so the values the government assigns may differ from one home to the next.

In each round, you will be told the range of possible values the government could assign for tax purposes. The taxes you pay will be the value of your home as determined by the government times the tax rate.

You can pay an additional tax to the government, which is referred to as the Government Information Tax, to provide the government with additional resources to collect more detailed information about your home like the interior space, the age of the home, etc. This information will help the government determine the value of your home and will reduce the range of possible values that might be assigned to your home. This also reduces the range of possible property taxes you would have to pay. The larger the Government Information Tax you pay, the greater the reduction in the range of possible values the government will set for you home—that is, the largest and smallest possible values will be eliminated. This then reduces the range of taxes you might have to pay. This means that the probability of each of the remaining possible home values will increase, as the probabilities must add up to one. Each of the possible home values is equally likely. Note that you can choose not to pay any Government Information Tax and accept the larger range in home values and taxes.

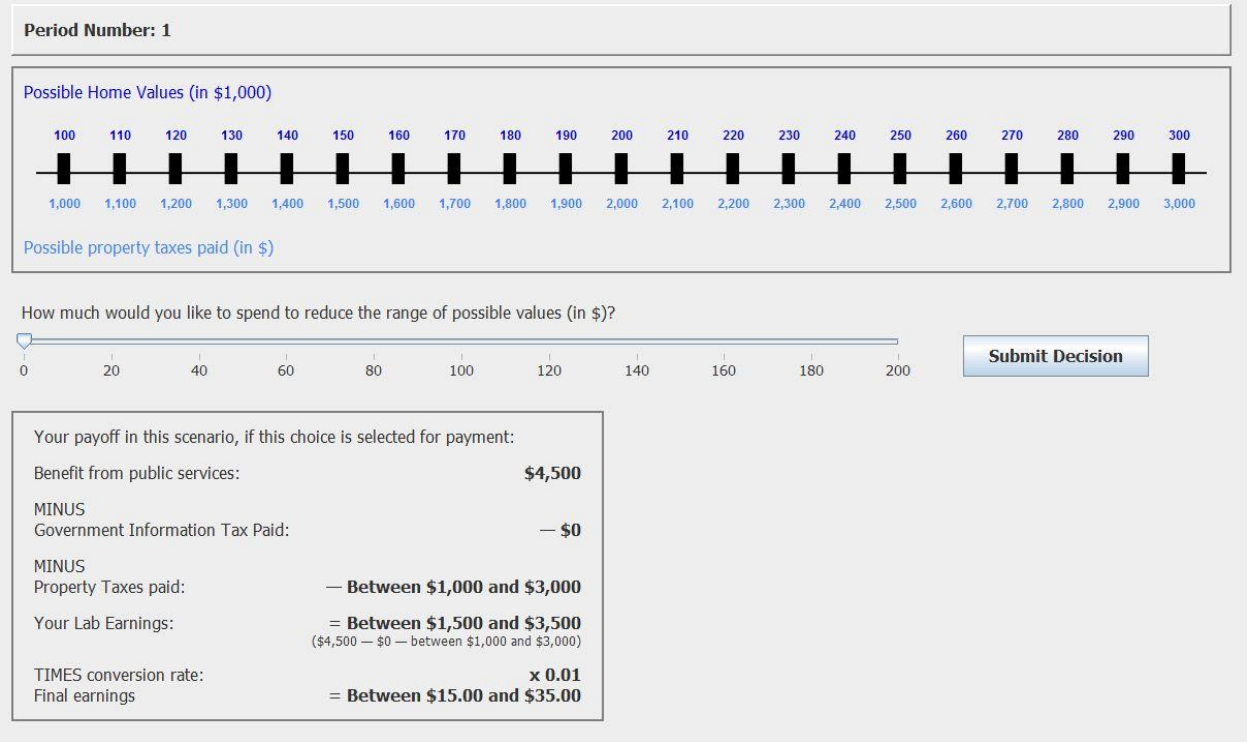
The cost of the Government Information Tax may be different from one round to the next. The cost will always be shown to you on the screen.

At the beginning for each round, you will see a range of possible assigned home values and the corresponding taxes you would pay for each home value. You will also see a "slider" that can be

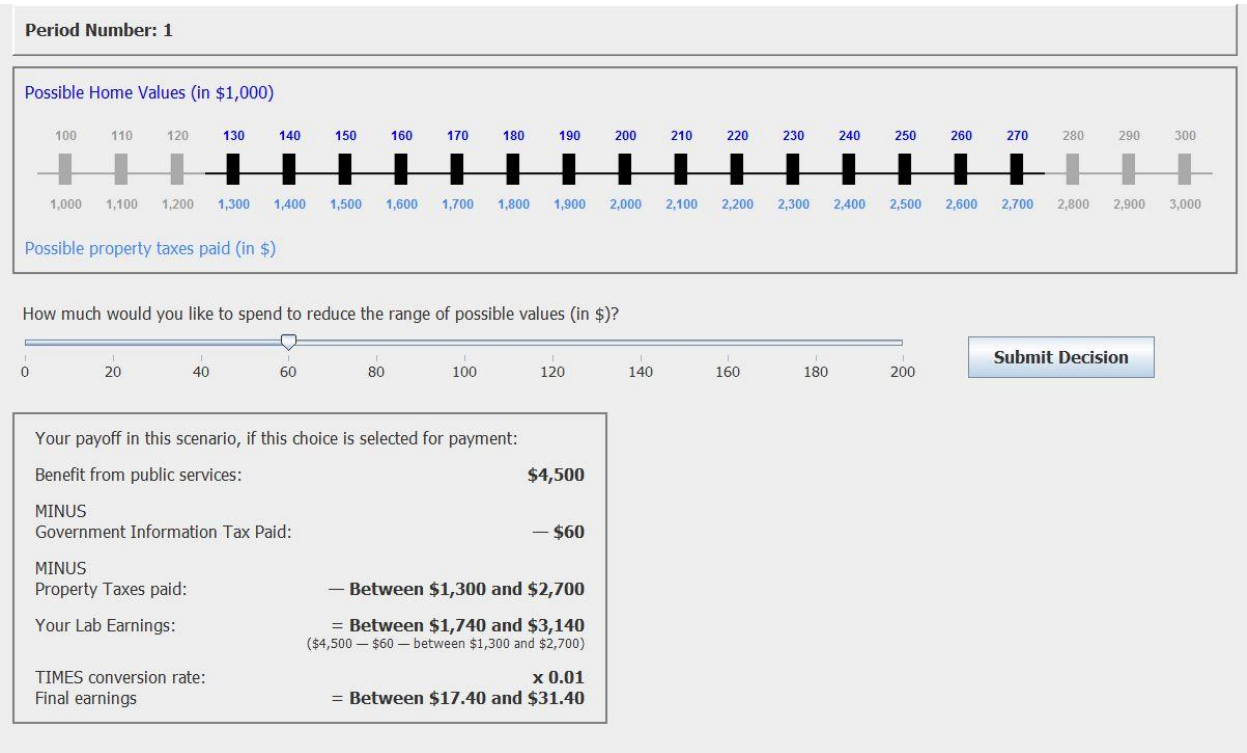
moved to indicate the amount you will spend to reduce the range of possible values and associated property taxes. As you move the slider, you will see that the range of taxes will decrease and the probability of each tax will increase. Once you have decided on how much to spend on the Government Information Tax, click on the SUBMIT button. The amount you paid for the Government Information Tax, if any, will be subtracted from your INDIVIDUAL FUND.

At that point, one of the possible assigned property values for your home and the associated property taxes, will be selected at random by the computer. There is an equal chance that any of the taxes shown on the screen will be selected. The amount shown will be subtracted from your INDIVIDUAL FUND.

Let's consider some examples. The two pictures are examples of what you will see on the screen.



The first picture is an example of the screen you will see at the beginning of the round. The top box shows the possible assigned home values in dark blue and the possible property taxes in light blue. The slider on the bar in the middle can be moved to select the amount you want to pay to reduce the range of assigned values. The box at the bottom summarizes the benefits and costs; the values will change as you move the slider. Once you have determined the amount you want to spend to reduce the range of assigned home value and have set the slider on that amount, clicking on the "Submit Decision" box will submit the decision.



In the second picture, the player has moved the slider to $60. This has reduced the range of possible taxes to between $1,300 and $2,700. If the player were to now click the SUBMIT button, one of the values between $1,300 and $2,700 would be selected at random, with equal probability.

To sum up:

- You will be randomly assigned to a group of 5 people.
- You will be with the same group of people for 15 rounds.
- You own a home in a neighborhood.
- The local government provides you with public services, which can be measured as a benefit, which will be **added** to your INDIVIDUAL FUND.
- To provide these services, the local government estimates the value of your property and collects property taxes. The assigned value of your property and the resulting taxes will be randomly selected from a set of available options.
- You can pay a Government Information Tax to reduce the range of possible values (and taxes), or choose not to pay to reduce this range. This tax payment will be **subtracted** from your INDIVIDUAL FUND.

- Once you have chosen the Government Information Tax level, the assigned value of your home is randomly selected from the range of possible values and the associated property taxes will be **subtracted** from your INDIVIDUAL FUND.
- At the start of each round your INDIVIDUAL FUND will again be set to zero.

Instructions for the Next Set of Rounds **GG**

You will now be randomly assigned by the computer into groups of 5 people.

Remember, you will be with the same group of people for 15 rounds.

In each round, you and the other members of your group own homes in a neighborhood. The local government provides public services that offer you benefits, which can be measured in dollars, and which will be shown to you on the screen. This amount will be deposited into your INDIVIDUAL FUND for the round.

To pay for these services the government must impose taxes on you and your neighbors. The tax used is a property tax, which works as follows. The government attempts to determine the value of everyone's home. However, valuing homes is not an exact science, and thus the value that the government sets for your property can fall anywhere within a range of possible values. The range of possible values for you and your neighbors have is identical, although the homes look different, and so the values the government assigns may differ from one home to the next.

In each round, you will be told the range of possible values the government could assign to your home for tax purposes. The taxes you pay will be the value of your home as determined by the government times the tax rate.

You can propose that you and each of your neighbors pay an additional tax to the government, which is referred to as the Government Information Tax, to provide the government with additional resources to collect information about the homes in the neighborhood like the interior space, the age of the home, etc. This information will reduce the range of possible values that might be assigned to each of the 5 homes in your neighborhood. This also reduces the range of possible property taxes you and your neighbors would have to pay. The larger the Government Information Tax you and your neighbors pay, the greater the reduction in the range of possible values the government will set for the homes in the neighborhood—that is, the largest and smallest possible values will be eliminated. This then reduces the range of taxes you and each of your neighbors might have to pay. This means that the probability of each of the remaining possible home values will increase, as the probabilities must add up to one. Each of the possible home values is equally likely. Note that you can propose to have no Government Information Tax for you and your neighbors.

The cost the Government Information Tax may be different from one round to the next. The cost will always be shown to you on the screen.

Once everyone has submitted their choice for the additional per-group-member tax, the two highest and two lowest choices will be set aside by the government agency. The remaining choice, which is the choice that falls in the middle of your group of 5 members, will be the Government Information Tax paid by EVERY group member as the tax to provide additional information.

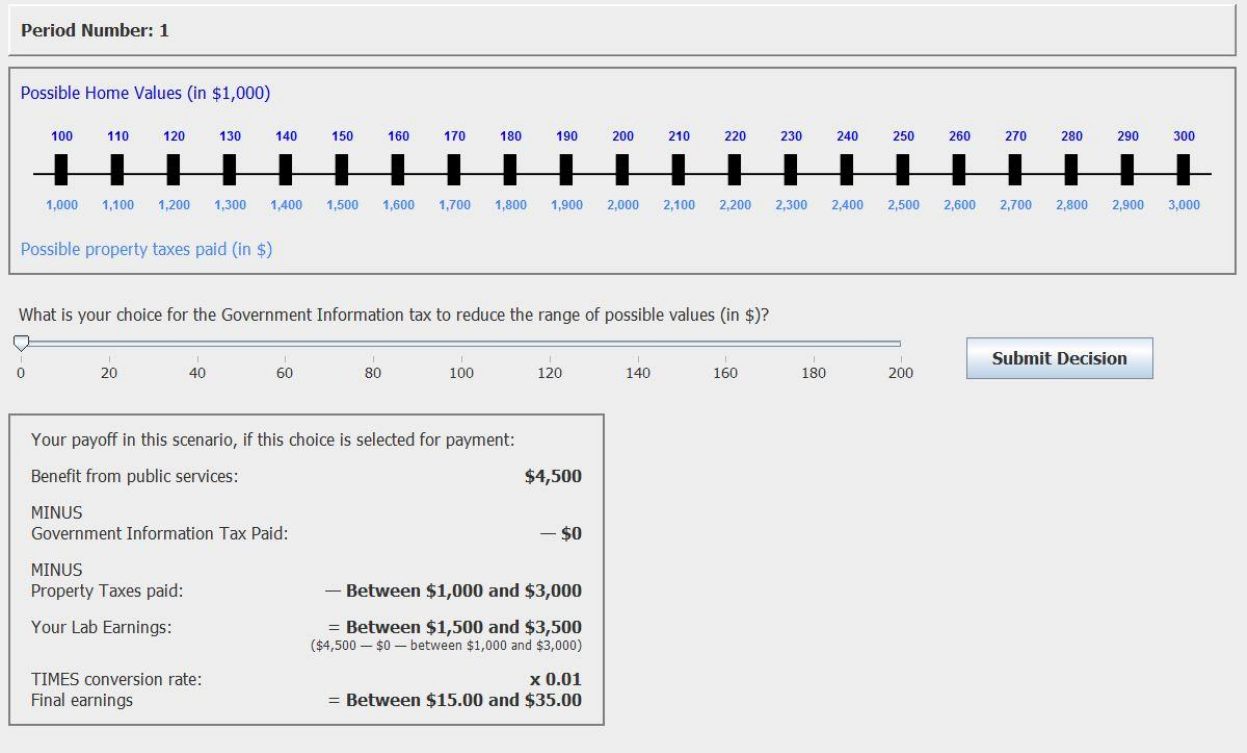
At the beginning for each round, you will see a range of possible assigned home values and the corresponding taxes you would pay for each home value. You will also see a "slider" that can be moved to indicate the per-group-member amount you would like yourself and your neighbors to spend to reduce the range of possible values and associated property taxes. As you move the slider, you will see that the range of taxes will decrease and the probability of each tax will increase. Once you have decided how much you would like you and your group members each to spend on the Government Information Tax, click on the SUBMIT button.

Once all group members have clicked SUBMIT, the middle choice of the Government Information Tax will be selected, and that amount, if any, will be subtracted from your INDIVIDUAL FUND.

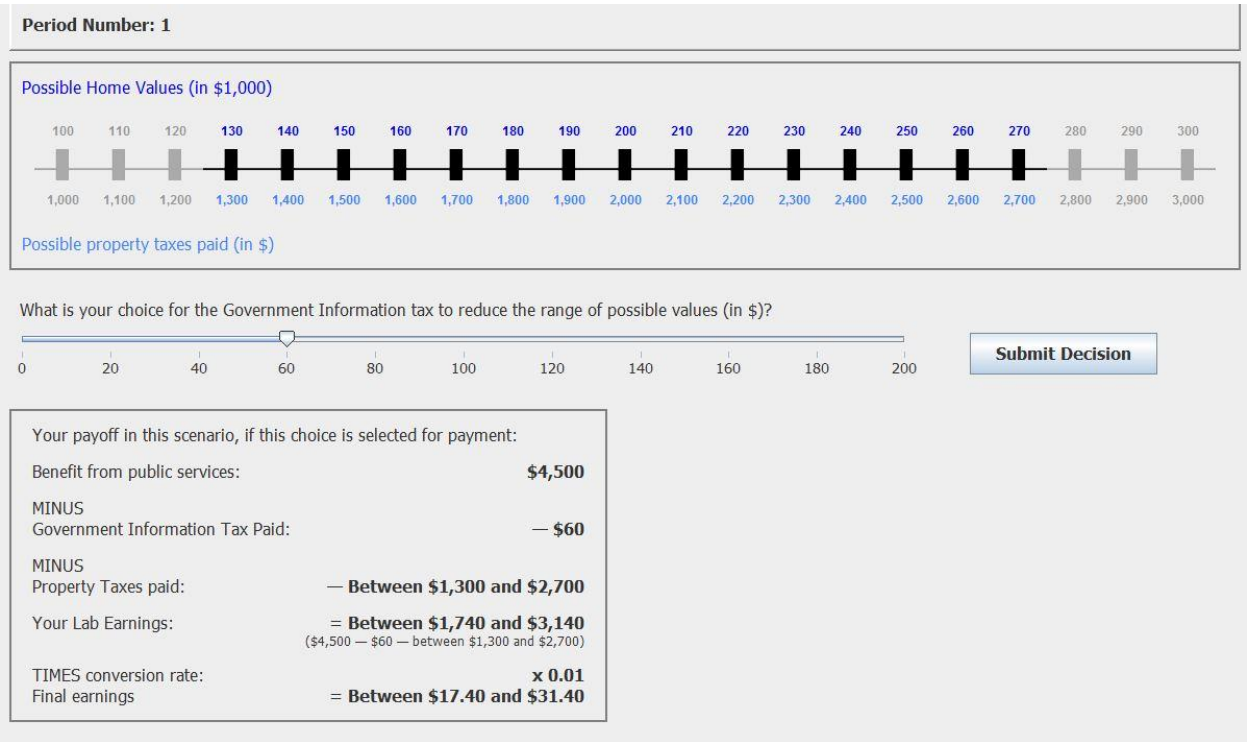
If the Government Information Tax that is selected by the group is not the level you proposed, the range of possible assigned property values will change to reflect the selected Government Information Tax.

At that point, one of the possible assigned property values for your home, and the associated property taxes, will be selected at random by the computer. There is an equal chance that any of the taxes shown on the screen will be selected. The amount shown will be subtracted from your INDIVIDUAL FUND.

Let's consider some examples. The two pictures are examples of what you will see on the screen.



The first picture is an example of the screen you will see at the beginning of the round. The top box shows the possible assigned home values in dark blue and the possible property taxes in light blue. The slider on the bar in the middle can be moved to select the amount you want to pay to reduce the range of assigned home values. The box at the bottom summarizes the benefits and costs; the values will change as you move the slider. Once you have determined the amount you want to spend and have set the slider on that amount, clicking the "Submit Decision" box will submit the decision.



In the second picture, the player has moved the slider to $60. This represents a proposal to reduce the range of taxes to between $1,300 and $2,700. If the player were to now click the SUBMIT button, that choice would be proposed for the group. Once each player has clicked SUBMIT, the middle proposal will determine the range of possible assigned home values (and the associated property taxes) and one of the values in that range would be selected at random, with equal probability.

To sum up:

- You will be randomly assigned to a group of 5 people.
- You will be with the same group of people for 15 rounds.
- You own a home in a neighborhood.
- The local government provides you with public services, which can be measured as a benefit, which will be **added** to your INDIVIDUAL FUND.
- To provide these services, the local government estimates the value of your home and collects property taxes. The assigned value of your home, and the resulting taxes, will be randomly selected from a set of available options.
- You and your neighbors can pay a Government Information Tax to reduce the range of possible values (and taxes). You can propose the Government Information Tax that you would like for you and each of your neighbors to pay.

- Once everyone has proposed a desired level of the Government Information Tax, the level that falls in the middle of the Government Information Tax amounts selected by the 5 group members will be selected as the actual level that will be imposed. This payment will be **subtracted** from your INDIVIDUAL FUND.
- Once the Government Information Tax level has been selected, the range of assigned values will reflect the chosen tax payment.
- The assigned value of your home is randomly selected and the associated property taxes will be **subtracted** from your INDIVIDUAL FUND.
- At the start of each round your INDIVIDUAL FUND will again be set to zero.