Local Public Goods Game: Notes to the Instructor

Materials needed:

- Two sets of instructions printed in two different colors (different values). One set of instructions per student.
- Two colors of ribbon to denote two different types of mobility, with one color to be tied around each student’s wrists. We recommend two feet of ribbon per student. (Alternatively, one can use two colors of index cards and have the students sign the cards in order to make them nontransferable.)
- One roll of bathroom tissue (for dividing the classroom into two dorms).
- Computer with prepared spreadsheet or the prepared Social Welfare Worksheet to tabulate voting results and to compute social welfare. You can download this spreadsheet at http://economics.kenyon.edu/corrigan/LocalResidentialSorting/LRS.htm
- Vote-counting infrastructure: either one assistant per 30 students to count hands raised, or the prepared ballot sheets.

Preparation:

- Put together a packet for each student, using envelopes or paper clips to hold them together. Each packet should contain one set of instructions (including record sheet), one ribbon (or colored index card), and optionally four ballots on which to write votes.
- Plan to distribute the packets somewhat unevenly, in preparation for dividing the room in half in Year 2. For example, plan to have 60% high-value individuals and 40% low-value individuals on the left side of the room, and 40% high-value individuals and 60% low-value individuals on the right side of the room.

Begin by handing out the instructions as above, and reading them aloud. Below is a detail of what to say as you read them aloud.
Instructions for the Local Public Good Game (Instructor)

Suppose you live in a dorm that’s deciding how much money to raise for a collective fund that will be spent on parties and social events for your dorm. Your dorm is voting on the amount of money that each resident will equally contribute to the fund for the current school year.

Your room, board, and tuition are already paid for, and you have a spending allowance of $1000 at the beginning of each year that you may use freely for entertainment, books, etc.

The dorm will decide on a level of per-capita taxation, $T$, between 0 and 100, which will be paid out of your $1000 spending account. The level of taxation will represent the number of dollars in taxes that you and everyone else in your dorm must each pay. These taxes will be used to sponsor social events in your dorm. Residents of your hypothetical dorm enjoy these social events differently. As a result, you have each been assigned a personal value multiplier. You cannot change the assigned multiplier.

*Here in your instructions is a multiple of $T$ which describes how much the public good is worth to you. This multiplier has been assigned to you and it is private information—you should not share it with anyone.*

To calculate the value you derive from your dorm’s parties and social events, take your personal value multiplier times $T$. In your case, the value you derive would be some number times $T$. As other people may have different values, we ask that you keep your value private.

In addition to these instructions, you have received a record sheet. You will be using this sheet to record the level of taxes, $T$, imposed by the dorm, as well as the value that you receive from the parties that are funded by these taxes. You will also calculate your after-tax welfare: that is, the value of your spending account ($1000), minus the taxes you pay, plus your own personal value of the social events. Here’s the way your record sheet will look:

<table>
<thead>
<tr>
<th>Level of taxation chosen ($T$): ______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your spending account</td>
</tr>
<tr>
<td><strong>PLUS</strong></td>
</tr>
<tr>
<td>Your value of the social events ( = your multiplier times $T$) ______</td>
</tr>
<tr>
<td><strong>MINUS</strong></td>
</tr>
<tr>
<td>Your tax payment for the social events ( = $T$) ______</td>
</tr>
<tr>
<td><strong>EQUALS</strong></td>
</tr>
<tr>
<td>Your after-tax welfare</td>
</tr>
</tbody>
</table>

To determine the taxation level, the dorm’s governing committee will survey its residents. They will ask which of three possible taxation levels you prefer: 0, 50, or 100. They will then calculate the average of your choices and impose that average as the taxation level.
Are there any questions so far?

Let’s work through an example.

Imagine that there are 10 residents in your dorm, and that 2 of them vote for a level of $0 taxes, none vote for $50, and 8 vote for $100. The average choice is then

\[
\frac{(2 \times 0) + (0 \times 50) + (8 \times 100)}{10} = 80,
\]

so the taxation level will be $80 for everyone in the dorm. We have used this information to calculate your after-tax welfare on the following practice worksheet:

<table>
<thead>
<tr>
<th>Level of taxation chosen ((T)):</th>
<th>$80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your spending account</td>
<td>$1,000</td>
</tr>
<tr>
<td>PLUS</td>
<td>Your value of the social events (= your multiplier times (T))</td>
</tr>
<tr>
<td>MINUS</td>
<td>Your tax payment for the social events (= T)</td>
</tr>
<tr>
<td>(EQUALS)</td>
<td>Your after-tax welfare</td>
</tr>
</tbody>
</table>

Are there any final questions before we begin?

Your local government will now conduct its first survey. Take a moment to think about which of the following three options you prefer:
- Taxation of $0
- Taxation of $50
- Taxation of $100

After the vote is taken, we will announce the results and will then proceed to the next year.

At the beginning of each year, you will be given verbal instructions related to that particular year. Please listen carefully and do not hesitate to ask questions if you have them.
Now proceed with the experiment.

Year 1

First, ask those who prefer taxation level 0 to raise their hands. Count the votes (or use some other method of counting the votes) and enter the number into the spreadsheet. Do the same for taxation levels 50 and 100. The spreadsheet will calculate the average taxation level; announce this publicly. Then ask everyone to fill out the lines under Year 1 and record how satisfied (or unsatisfied) they are.

Year 2

Now announce:

“The community leaders have decided to split the dorm into two smaller dorms, Right and Left (you can use East and West, or North and South if you prefer). Each dorm will have its own tax rate and resulting level of public good.”

Identify a student in the back of the room, and toss the roll of toilet paper to him or her (or unroll it) so that it forms a boundary between the students.

“Everyone to one side of the boundary is in the Right dorm, and the other side is in the Left dorm. Your new local government will conduct a separate survey in each dorm to decide how to set the tax rates.”

Allow each side of the room to take the same vote as above in Year 1. Announce and record the votes and tax rates separately. Instruct students to compute their after-tax welfare levels.

Ask students if they are more or less satisfied than they were in Year 1.

Year 3

Now tell the students that they have been given different colored ribbons or cards. Those with one color (e.g., Blue) have enough money that they can move to the other dorm if they want. First allow those in the Right to move to the Left, then those in the Left to move to the Right. You can have a toll bridge over which they have to cross in order to check that they have the correctly-colored ribbon or card. Once everyone is reseated, conduct two new votes, one in each dorm as above. Again, ask who has improved their situation from the previous round and who is worse off.

Year 4

Finally, announce that everyone is now free to move to whichever dorm they like (free mobility). Take a final vote in each town and ask who has improved their situation. Note that the dorms should now be perfectly segregated—those with high values for the public good are all on one side of the room, and those with low values are on the other side.
<table>
<thead>
<tr>
<th>Year 1</th>
<th>Which of the following three levels of taxation do you prefer?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ $0</td>
</tr>
<tr>
<td></td>
<td>□ $50</td>
</tr>
<tr>
<td></td>
<td>□ $100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Which of the following three levels of taxation do you prefer?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ $0</td>
</tr>
<tr>
<td></td>
<td>□ $50</td>
</tr>
<tr>
<td></td>
<td>□ $100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Which of the following three levels of taxation do you prefer?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ $0</td>
</tr>
<tr>
<td></td>
<td>□ $50</td>
</tr>
<tr>
<td></td>
<td>□ $100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Which of the following three levels of taxation do you prefer?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ $0</td>
</tr>
<tr>
<td></td>
<td>□ $50</td>
</tr>
<tr>
<td></td>
<td>□ $100</td>
</tr>
</tbody>
</table>
Social Welfare Worksheet

For the sake of simplicity, this worksheet assumes that residents in the Right are disproportionately high valuers. As a result, when students begin moving in Years 3 and 4, this assumes that high valuers are moving to the Right and that low valuers are moving to the Left. This also assumes that in Year 4 there will be perfect separation, with all of the high types living in the Right and all of the low types living in the Left.

Initial Distribution

Total Number of Students (Total) _____

High Types in Right (Hi\(^R\)) _____  Low Types in Right (Lo\(^R\)) _____

High Types in Left (Hi\(^L\)) _____  Low Types in Left (Lo\(^L\)) _____

Year 1

Level of taxation chosen (T) _____

Social Welfare = Total \(\times\)1000 + (Hi\(^R\) + Hi\(^L\) – Lo\(^R\) – Lo\(^L\))\(\times\)T

= \(\times\)1000 + (\(\square\) + \(\square\) – \(\square\) – \(\square\))\(\times\)

= 

Year 2

Level of taxation in Right (T\(^R\)) _____

Welfare in Right = (Hi\(^R\) + Lo\(^L\))\(\times\)1000 + (Hi\(^L\) – Lo\(^R\))\(\times\)T\(^N\)

= (\(\square\) + \(\square\))\(\times\)1000 + (\(\square\) – \(\square\))\(\times\)

= 

Level of taxation in Left (T\(^L\)) _____

Welfare in Left = (Hi\(^R\) + Lo\(^L\))\(\times\)1000 + (Hi\(^L\) – Lo\(^R\))\(\times\)T\(^S\)

= (\(\square\) + \(\square\))\(\times\)1000 + (\(\square\) – \(\square\))\(\times\)

= 

Social Welfare = _____
Year 3

Number moving Right to Left \( \left( L_{\text{New}}^r \right) \) _____
Number moving Left to Right \( \left( H_{\text{New}}^r \right) \) _____

Level of taxation in Right \( (T^N) \) ______

Welfare in Right
\[ = \left( H^r + \frac{H^r}{L_{\text{New}}^r} + \frac{L^r}{H_{\text{New}}^r} - \frac{L^r}{L_{\text{New}}^r} \right) \times 1000 + \left( H^r - \frac{H^r}{L_{\text{New}}^r} - \frac{L^r}{H_{\text{New}}^r} + \frac{L^r}{L_{\text{New}}^r} \right) \times T^N \]

Level of taxation in Left \( (T^S) \) ______

Welfare in Left
\[ = \left( L^l - \frac{L^l}{H_{\text{New}}^l} + \frac{L^l}{L_{\text{New}}^l} - \frac{L^l}{L_{\text{New}}^l} \right) \times 1000 + \left( L^l + \frac{L^l}{H_{\text{New}}^l} - \frac{L^l}{L_{\text{New}}^l} + \frac{L^l}{L_{\text{New}}^l} \right) \times T^S \]

Social Welfare = ______

Year 4

Level of taxation in Right \( (T^N) \) ______

Welfare in Right
\[ = \left( H^r + \frac{H^r}{L_{\text{New}}^r} \right) \times (1000 + T^N) \]

Level of taxation in Left \( (T^S) \) ______

Welfare in Left
\[ = \left( L^l + \frac{L^l}{H_{\text{New}}^l} \right) \times (1000 - T^S) \]

Social Welfare = ______