Principles of Economics I

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Problem Set 3 (Due September 30, 2022)

1. This exercise contains three excerpts from a British quiz show called Golden Balls. After each clip, you are asked to use the game theoretical tools you learned in Lectures 4-5 to analyze the situations. you should listen carefully to what the contestants say in. the videos (apologies for the poor sound quality in some of them).

    (a) Watch this **video clip 1** until 2:20 Draw the game between Lucy and Tony as a game matrix when Lucy and Tony care only about money. Continue next until the end of the clip. Based on their words and decisions, what do you think about their real preferences?

    (b) In the second excerpt, Sarah and Steve have collected GBP 100 000 in the pot. This **link** takes you to the point where Sarah and Steve start talking. If you want, you can rewind to see the introduction to the game again. What do you conclude about Sarah's and Steve's preferences?

    (c) In the last excerpt, Ibrahim and Nick play for GBP 13 600. This **video** begins at the point where Ibrahim and Nick start talking. One way to interpret what is going on is that Nick wants to convince Ibrahim that part of the game matrix is no longer relevant. How would this affect Ibrahim's optimal strategy?

2. Tax collection is complicated by the existence of tax fraud. Fraud can be detected by experienced tax officer but unfortunately it is costly to hire those officers. Consider then the following model of tax fraud. There are two players: (tax) officer and (tax) payer. The officer decides whether to monitor the filings of the tax payer at a cost or not monitor. The tax payer files either honestly or fraudulently. Honest filings are always accepted but fraudulent filings are caught if the officer chooses to monitor. With an undetected fraudulent filing, the tax payer pays

little taxes. With an honest filing, she pays a moderate amount. If she files fraudulently and is caught, then she pays a very large fine on top of honest taxes. The tax officer pays nothin and receives no payments if she does not monitor. She pays the cost of monitoring if she monitors and from the fraudulent taxes she also collects the fine.

(a) Draw a game matrix for this situation. Assume first that the payoffs are simply the monetary payoffs to the players.

(b) Does this game have dominant strategies? What about Nash equilibria?

(c) How does the game change if you allow for the possibility that tax payers may feel guilty about committing tax fraud?

3. We talked about negative effects on other decision makers in our discussion of pollution and fossil fuel reduction. Let's be more positive for a change and discuss positive effects. These are slightly more open ended examples where insights from game theory are useful.

(a) Credit cards make it easy for you to purchase goods in stores that accept them even when you have run temporarily out of money. Discuss the externalities that you impose on other consumers when you choose to have a credit card.

(b) You get information about the quality of a new restaurant from reviews on the internet. Would you rather go first or wait for a sufficient number of reviews, Someone must be the first to dine in the restaurant to create the first reviews. What can the restaurant do to get the first customers. How can you trust the reviews (i.e. how do you know it is not the restaurant saying good things about itself)?

(c) New knowledge produced in academic research is useful to firms and individuals that are not directly involved in the research leading to it. Hence we can view knowledge as a public good that is produced at costs that are borne by the researchers. Discuss the institutions that lead to quick spread of academic knowledge. Private firms also engage in scientific research and the results of

their research effort may be valuable to outsiders. What institutions enhance the spread of knowledge embodied in private sector innovations?

4. Consider an economy country of 5 equal size groups i of individuals with annual income y_i for group $i \in \{1, ..., 5\}$. Assume that the groups are ordered so that $y_1 \leq y_2 \leq ... \leq y_5$. The Lorenz curve of this economy is given by the broken line connecting points:

$$(0,0), \left(\frac{1}{5}, \frac{y_1}{y_1 + y_2 + y_3 + y_4 + y_5}\right), \left(\frac{2}{5}, \frac{y_1 + y_2}{y_1 + y_2 + y_3 + y_4 + y_5}\right),$$

$$\left(\frac{3}{5}, \frac{y_1 + y_2 + y_3}{y_1 + y_2 + y_3 + y_4 + y_5}\right), \left(\frac{4}{5}, \frac{y_1 + y_2 + y_3 + y_4}{y_1 + y_2 + y_3 + y_4 + y_5}\right), (1,1)$$

(a) Draw the Lorenz curve for a country where $y_i = 90$ for all $i \in \{1, ..., 5\}$.

(b) Draw the Lorenz curve for another country where $y_i = 30i$ for all $i \in \{1, ..., 5\}$ (so that $y_1 = 30, y_2 = 60$, etc.)

(c) Draw the Lorenz curve for a poorer country where $y_i = 20i$ for all $i \in \{1, ..., 5\}$ (so that $y_1 = 20, y_2 = 40$, etc.)

(d) Draw the Lorenz curve for the case where $y_i = 60 + 10i$ for all $i \in \{1, ..., 5\}$ (so that $y_1 = 70, y_2 = 80$, etc.)

(e) Compare the Gini-coefficients in the above cases.

(f) Compare the Gini-coefficients of Country A where $y_1 = y_2 = y_3 = y_4 = 30$ and $y_5 = 120$ and Country B where $y_1 = y_2 = 0$ and $y_3 = y_4 = y_5 = 80$. Which country do you think has more inequality? How do you compare the countries with other criteria such as the income share of top 1% (or top 10%) or the ratio of income at the 90th percentile to income at the 10th percentile?