INTERNATIONAL ECONOMICS OLYMPIAD

2022

Open Questions

Solve no more than 4 questions out of 5. Indicate your choice of questions.

If you provide solutions for all 5 questions, all of them will be commented on by the Jury, but only 4 will add to your score. In this case, if you do not specify which to grade, the maximum grade of 5 will be excluded.

Every open question is worth 30 raw points.

If not stated otherwise, think of all goods, services and assets as of infinitely divisible. Numbers of firms and people may be only integer.

Convey your ideas clearly. Don't skip important logical transitions in your reasoning.

Good luck!

Question 1. "Measuring Inequality" *(30 raw points)*

In most of the tasks about inequality that you might encounter, the data on income or wealth is given and is not questioned. In reality, however, the estimates of these numbers can be biased, and these biases can make an unjustified impression about whether inequality is high or low. Unjustified impressions, in their turn, may lead to unreasonable policy-making. In this task, we will discuss what these biases might be and where they can come from.

(a) *(10 rp)* Ann uses the administrative (tax) microdata to estimate the income inequality in country N. In particular, she takes the amounts of income tax paid by all households per year, calculates incomes dividing tax payments by the tax rates and gets the Gini coefficient based on this income distribution. Bob argues that due to this approach, Anna is likely to overlook a substantial part of the real income distribution. What part is it? Does this bias lead to overestimating or underestimating the extent of income inequality?

(b) *(10 rp)* Bob uses the surveys data to estimate the income inequality in country N. In particular, he refers to the statistics obtained by a sociological service that regularly asks people about their households' consumption spending (income surveys are also available, but Bob doesn't trust how households report their incomes). Ann argues that Bob's results are biased, too. Why is that? Does this bias lead to overestimating or underestimating the extent of income inequality?

(c) *(10 rp)* Carol believes that over time, top 1 percent of incomes in country N are rising more quickly than average incomes. To verify this belief, she has taken Ann's and Bob's estimates at different times. It turned out that one of them does not contradict the belief, but the other one does. Explain which one is which and why it is so.

Question 2. "Trade Sanctions and Segmentation" *(30 raw points)*

There are 100 countries in the World. Demand in country number i for natural gas is given by $D_i(p_i) = 100i - p_i$, while its supply is given by $S_i(p_i) = ip_i$.

(a) *(5 rp)* Find equilibrium prices $p_i^\star$ when countries do not trade with each other.

(b) *(5 rp)* Assume there is a global market for natural gas, in which all countries participate. Find the equilibrium in this market. Determine what countries are net exporters of the natural gas and what countries are net importers.

(c) *(5 rp)* Assume that the world imposes sanctions against country number j and discontinues trade with it. How will this affect the world price? Which agents in other countries will gain and which will lose? What can one say about the change in consumer and producer welfare in country j?

(d) *(15 rp)* Now assume that the global market splits into several blocs (some perhaps consisting of a single country); there is free trade within each bloc but no trade across blocs. Answer the following questions and explain your answers, comparing the results of destruction of the global market to the free trade situation in part **(b)**.

(d1) *(5 rp)* Can there be *a country* where the joint welfare of all consumers and all producers improve?

(d2) *(5 rp)* Can there be *a bloc* where the joint welfare of all consumers and all producers improve?

(d3) *(5 rp)* What happens to the joint welfare of all consumers and all producers in the world?

Question 3. "How to Finance Government Spending" *(30 raw points)*

Consider a closed economy where consumption spending depends on output: $C = C_0 + 0.8Y_d$, where $C_0 > 0$ is autonomous consumption and Y_d is disposable income (income after tax). The tax rate is flat at the level of 20% on all income without double taxation. The Short-Run Aggregate Supply (SRAS) is flat at $P = 1$. Investment is given by $I = 7.5 - 4r$, where r is the real interest rate expressed *in percentage points* (for example, $r = 1.12$ means that interest rate is 1.12%, not 112%). The supply of loanable funds is given by $S = 16r$. Initially, the equilibrium level of GDP $Y^\star = 100$, all demand for loanable funds comes from investment, the state budget is balanced. The government wants to reduce unemployment and increases G by 10.

(a) *(10 rp)* Assume that the government just has this money at its disposal, so there is no need to borrow it or find elsewhere. How will the increase in G affect GDP? If the increase in GDP does not equal to the increase in G, explain the difference.

(b) *(10 rp)* Now, assume that the government will finance its new spending through collected taxes, thus adjusting the tax rate. Find the new level of GDP in equilibrium. If it does not equal to the new level of GDP in **(a)**, explain the difference.

(c) *(10 rp)* Assume that instead of raising taxes, the government will borrow 10 in the financial market, affecting the interest rate. How will this affect GDP when the goods market and the loanable funds market are the new equilibrium? If it does not equal the new level of GDP does not equal the new level of GDP in **(a)**, explain the difference.

Question 4. "Shadow Economy" *(30 raw points)*

One of the problems with the GDP indicator is its inability to account for the production of goods and services in the underground (shadow) economy. By this we mean not only illegal production of forbidden goods and services but also housework, helping friends, etc. — everything that is not observable for official statistics, but would have to be included in GDP if it were observable.

Clearly state two different approaches for estimating the size of the shadow economy of a country. Explain why your approaches may work to achieve this goal. Also explain why they might not work (the disadvantages).

Question 5. "Going Green" *(30 raw points)*

There are two groups of consumers of solar panels in country S: 150,000 households who consider purchasing them because they care about the environment and 200,000 households who consider purchasing them because it is trendy (this is sometimes called the bandwagon effect). The demanded quantities of the solar panels are given by:

$$Q_{c(\text{are})} = 150{,}000 - p, \qquad Q_{b(\text{andwagon})} = 40{,}000 - 5p + 500\sqrt{N},$$

where p is the price of a solar panel (in USD) and N is the total quantity of solar panel users (in equilibrium, $N = Q_c + Q_b$). For simplicity, assume that Q_c, Q_b, and N can be non-integer. The supply of the solar panels is perfectly elastic, $p = 25{,}000$.

The market adjusts to the equilibrium in the following way. First, customers who care about the environment decide whether they will have solar panels. At every step after that, customers from the 'trendy' group observe the quantity of solar panels around and decide whether they will have solar panels based on this observation. This goes on until everyone is happy with their choice.

(a) *(5 rp)* How many solar panels will be purchased?

(b) *(15 rp)* The government introduces a per-unit subsidy $s = \$5{,}000$. Calculate the quantity of solar panels in equilibrium.

(c) *(10 rp)* After the equilibrium from **(b)** is reached, the government surprisingly eliminates the subsidy. Customers have the opportunity to return the once-purchased solar panels and get \$25,000 refunded (and indeed do this if their willingness to pay is below 25,000 per panel). Find the new equilibrium quantity of installed solar panels. Is your answer the same as in **(a)**? Why or why not?