

## Олимпиада для студентов и выпускников вузов – 2015 г.

### Направление «Экономика»

#### Профили:

«Экономика: исследовательская программа»  
«Прикладная экономика»

КОД - 110  
КОД - 111

**Время выполнения задания – 180 мин., язык – русский/английский.**

Решите задачи. Веса задач приведены в скобках

#### Инструкции

- Решение может быть представлено как на **русском**, так и на **английском** языке. Никаких дополнительных баллов, впрочем, как и штрафов, за решение на английском языке не предусмотрено.
- Решение должно быть хорошо структурированным, изложено грамотным языком, а почерк – распознаваемым. Ответы на качественные вопросы должны быть убедительно аргументированы, но длинные рассуждения, не относящиеся к сути дела, могут негативно повлиять на оценку.
- Все шаги в решении должны быть обоснованы, все вычисления должны присутствовать в работе. Калькуляторами пользоваться запрещено.
- Черновики не предусмотрены, решение сразу оформляется на чистовик.
- Если приведенное решение является неверным, перечеркните его (перечеркнутое решение не проверяется) и приведите корректную версию.
- При наличии нескольких вариантов решения одного и того же задания, проверяющий сам определяет, какое из решений подлежит проверке, а апелляции с просьбой проверить другой вариант решения не принимаются.

**1. (24 points) Answer the following short questions**

(a) Income tax in Russia is flat: regardless of a taxpayer's income she pays 13% tax from each ruble earned. In many countries the income tax is progressive: the tax rate increases with income. Some politicians argue in favor of progressive taxation, while economists often defend the flat rate. What pros and cons do you see in the flat income tax?

(b) One can show that a firm competing in a Cournot duopoly may gain from hiring a manager known to be "aggressive" (for instance, an overoptimistic manager who underestimates the negative effect of increased output on the market price). Explain this effect (you may use a diagram with reaction curves). If both firms hire aggressive managers, do they gain from such policy collectively?

(c) When two individuals A and B start trading with each other then both gain from trade. If the third individual C starts trading with A and B, will this necessarily result in a Pareto improvement? (Assume that agent does not start trading if he is indifferent).

(d) In order to ensure stability of financial system, the central bank acts as a lender of last resort. It means that the monetary authority can provide commercial banks with liquidity in case of emergency. What are positive and negative effects of this policy? Explain your answer.

**2. (25 points) Crime and punishment**

Consider a criminal person with initial wealth  $w = \$144$  and utility function  $u(x) = \sqrt{x}$ , who is going to commit a theft. The cost of equipment needed to commit the crime is \$8 and the object stolen could be sold for \$60. If the person is caught by the police then the object stolen is confiscated (or if it was sold then its price should be reimbursed) and in addition the fine of \$2 per \$1 stolen should be paid. Suppose that this person's assessment of being caught by the police is 0.1.

(a) Will this person commit the theft?

(b) Suppose that he can commit this crime with the partner. In this case they share all the costs and benefits equally. Will he commit the crime with the partner? What can be inferred from this example about the fine rates needed to prevent the crimes committed in group in comparison with the individual ones?

(c) Now, suppose that the person can choose any number of partners to commit this crime and all gains and losses are shared equally between the partners. Derive the equation that characterizes the optimal number of partners (ignore integer constraint). No need to solve it.

(d) If the government was successful in convincing citizens that the probability of being caught is actually higher than the one expected by the criminals, how this will affect the decision of the considered criminal person on the number of the partners? Is it possible to generalize this result and make a prediction about the aggregate impact of government policy on the number of crimes committed in groups (for the crimes of some particular value – for example, bicycle theft)?

**3. (26 points) Is technology a public good?**

Empirical studies on economic growth point at the following facts:

- There exists a ‘club of convergence in growth rates’. This means that in many countries, the rates of growth of the GDP per capita converge to the same value in the long run. If one country grows faster than the others, we expect that its rate of growth will decrease, and if one country grows slower, we predict an increase in its growth rate.
- There are ‘outsiders’, which are the countries with extremely low GDP per capita, growing much slower than the world on average, and where the rate of growth does not tend to increase.

The objective of this problem is to explain these facts. To do this, answer the following questions:

**(a)** Define a rival good [rival good – конкурентное благо]. Do you think that technologies are rival or non-rival? Explain your answer using an example.

**(b)** Define an excludable good [excludable good – исключаемое благо]. Provide a microeconomic example, where a technology is an excludable good, and an example, where it is not. Explain why in each example the technology is or is not excludable.

**(c)** Assume that most technologies are non-excludable, so in the long run all countries achieve the same technological level. Use the Solow’s growth model to answer the following questions:

**(i)** Can the assumption of non-excludable technologies explain the existence of the club of convergence in growth rates? Explain your answer using the Solow’s diagram, the notion of the balanced growth path, and the concepts of absolute and conditional convergence.

**(ii)** Can the assumption of non-excludable technologies explain the existence of outsiders?

**(d)** Whether technologies are excludable or not at the microeconomic level, they may still be excludable at the cross-country level. For example, if a firm producing cars in the US decides to build a new plant in Africa, it plausibly can copy its production unit without additional spending on research and development, but it has to re-invent its way of hiring workers, to find new providers of intermediate goods, to adjust the business to the local legislation, and so on. Therefore, if one country has spent some resources to develop a new technology, another country cannot use this technology unless it bears adaptation costs, in which case the technology is excludable at the cross-country level. You may use the Solow’s model to illustrate your ideas, but this is not required in this question.

**(i)** How the idea of excludable technologies is related to the concept of *advantage of backwardness*, where less developed countries may grow faster than more developed because of technology transfers?

**(ii)** Taking into account your answer to the previous question, can the assumption of excludable technologies explain the existence of outsiders and be consistent with the existence of the club of convergence in growth rates?

**4. Monetary Policy (25 points)**

Consider a closed economy with fixed prices and wages, where the expected inflation is zero, and where the price level is constant,  $P = 1$ . It is also known that:

- The consumption function is  $C = 10 + 0.8(Y - T)$ , where  $Y$  is the aggregate income (the gross domestic product), and  $T$  is the net tax revenue,  $T = 50$ ;
- All taxes are autonomous;
- The investment function is  $I = 80 - 20r$ , where  $r$  is the real interest rate;
- The government purchases are  $G = 50$ ;
- The demand for the real money balances is  $L = 0.1Y - 10r$ ;
- The monetary base (the high powered money),  $B$ , equals to the sum of the currency in circulation and the total reserves of the commercial banks, it is sustained by the central bank at constant level  $B = 16$ ;
- The money supply in this economy consists of the currency in circulation and the commercial banks' deposits. In the equilibrium, the currency is five times less than the deposits, and this ratio does not change;
- The reserve requirement is 10% of the deposits;
- In addition to the required reserves, commercial banks also hold excess reserves. Excess reserves-to-deposits ratio ( $er$ ) is given by  $er = \frac{0.9}{1 + 80r}$ .

(a) Provide intuitive explanation for the given relationship between the excess reserves-to-deposits ratio and the interest rate.

(b) Derive the money multiplier (which is determined by the ratio of money supply to money base) and find money supply as a function of interest rate. Explain this relationship.

(c) Find equilibrium output and equilibrium interest rate in this economy.

(d) If government increases government purchases, what can Central Bank do in order to keep interest rate constant? Indicate at least two instruments that Central Bank can use to achieve this goal. Illustrate your answer using side-by-side money market and IS-LM diagrams.

**Олимпиада для студентов и выпускников вузов – 2015 г.**