Macroeconomia II – Exame – Época Normal
12 de junho de 2023 - 15h00
Duração da Prova: 2h00m

ATENÇÃO

- **As respostas deverão ser dadas em quatro cadernos separados: um para cada grupo de questões.**
- **Só é permitida a utilização de calculadoras científicas sem capacidade gráfica.**
- **Apenas é permitida a consulta de um formulário com apenas uma página (um só lado) e escrito à mão – e de mais nenhum elemento de consulta.**
- **Leia atentamente as questões e responda a tudo o que for pedido na pergunta.**

GRUPO 1 (5 valores)

1.1 It is known that in 2022 the GDP per capita of the United Kingdom was USD 52 600 and that the GDP per capita of Japan was USD 43 528.

Indicate whether the following expressions are true or false, presenting the necessary calculations to reach this conclusion:

a) (1 value) If the GDP per capita of the United Kingdom grows at an annual rate of 5% and that of Japan at 11% per year, in 5 years the per capita product of both countries will be identical.

FALSE

Japan - 43.528* (1,11)^5 = 73.347,72

UK - 52.600*(1,05)^5 = 67.132,4

b) (1 value) If in 2012 the GDP per capita of Japan was USD 32 865 and that of the United Kingdom USD 46 538, we can conclude that there was convergence between the real both countries in the period 2012-2022.

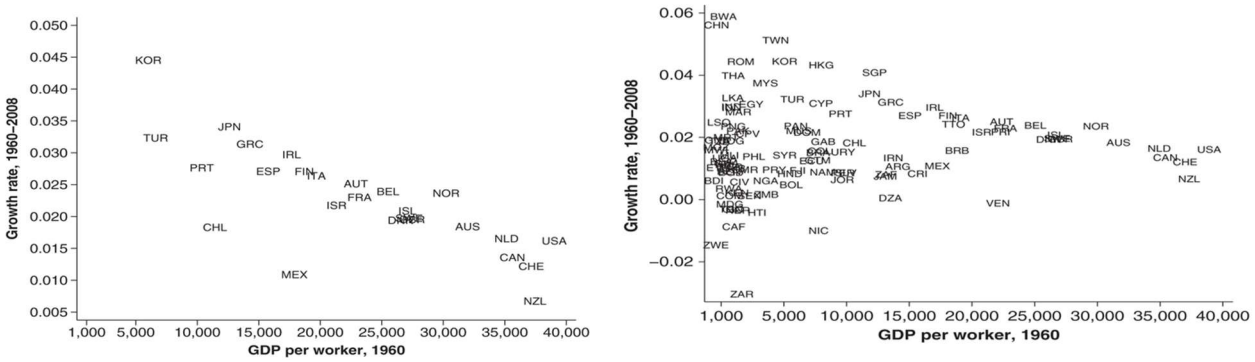
TRUE

Tx. Média Crescimento Japão 2012,2022 = [(43.528/32.865)^1/10) – 1]*100= 2,84%

Tx. Média Crescimento RU 2012,2022 = [(52.600/46.538^1/10) – 1]*100= 1,23%

The initially poorest economy (Japan) had the strongest growth relative to the richest (United Kingdom) confirming the occurrence of real convergence between these two countries. The average annual growth rates or the relative GDPpc of the two countries in 2012 and 2022 could also be compared – the conclusion would be identical.

1.2 Look at the following two figures. In both, the x-axis represents the level of GDP per worker in 1960 and the y-axis represents the average annual growth rate of GDP per worker between 1960 and 2008. The position of each acronym (KOR , TUR, etc) indicates the value relative to each country on each of these axes. The figure on the left shows all the countries of the Organization for Economic Co-operation and Development (OECD, industrialized countries), while the figure on the right shows most of the countries in the world for which data were available.



a) (1,5 valores) Indicate, justifying, to what extent do these two figures suggest the existence or not of real convergence between these sets of countries in the period 1960-2008.

The figure on the left suggests the occurrence of real convergence among OECD countries in the period 1960-2008, as the point cloud clearly has a negative slope, indicating that countries that initially had the lowest level of labor productivity showed the highest rates higher growth averages. The figure on the right, on the other hand, suggests that there was no such real convergence in the group of countries on the planet, as there is no clearly negative (nor positive) slope in the cloud of points, and therefore there is no clearly perceptible relationship between the initial level of Y/ L is the tmc of this variable (we only clearly note that the variance of the tmc is much greater among the initially poorest countries, with some registering very strong growth and others very weak or even negative growth in the period).

b) (1,5 valores) Indicate, justifying, to what extent your answer to the previous paragraph is consistent with the predictions of the Solow model.

The Solow model predicts the occurrence of conditional convergence: as long as countries have the same steady state, they will tend to converge to that same steady state, and countries that are further away from it will do so at a higher rate. With regard to the two figures above, in which there is real convergence between the OECD countries but not between the world's countries as a whole, we can say that the figure on the left is more in line with the predictions of

the Solow model; or else we can hypothesize that the OECD countries are more similar to each other in terms of steady state, which is why they tend to converge towards an identical steady state, while this possibly does not happen among all the countries on the planet, which will present greater differences among themselves in terms of available technologies, savings rates, population growth, depreciation and, consequently, steady state.

GRUPO 2 (5 valores)

2.1 Consider the assumptions of the Harrod-Domar model to answer the following questions:

a) (1 point) Taking into account the exogenous variables of the reduced form equation (also called the guaranteed growth rate), critically discuss the measures that can be taken by governments to promote economic growth.

$$g^w = \left(\frac{s}{v}\right) - \delta$$

s - Savings rate. The higher the savings rate, the higher the growth.

v - Capital product ratio. The lower the capital-output ratio, the higher the economic growth.

δ – Depreciation rate. The lower the depreciation rate, the higher the economic growth.

Taking into account the Harrod-Domar model, to promote economic growth governments can:

Promoting an increase in the savings(investment) rate (variable s) – Easier measure (public investment, subsidy of interest on deposits and savings certificates, etc.)

Promoting an increase in the capital-output ratio (variable v) – Measure difficult to influence (may involve investments in R&D that promote technological progress)

Take measures to reduce the depreciation rate (variable δ) – Measure difficult to influence (it can also involve investments in R&D that promote technological progress in order to extend the durability of physical capital)

b) (1 valor) Assume that the economy of country X has a saving rate of 25%, a depreciation rate of 4%, and the productivity of physical capital is 0.2. Calculate the warranted growth rate.

Capital output ratio: $\frac{K}{Y} = v$

Produtivity of physical capital: $\frac{Y}{K} = \frac{1}{v} = 0.2$

Then $v = \frac{1}{0.2} = 5$

From the reduced form equation:

$$g^w = \left(\frac{s}{v}\right) - \delta$$

$$g^w = \left(\frac{0.25}{5}\right) - 0.04 = 0.01 = 1\%$$

The warranted growth rate is 1%

c) (1 valor) Assume that the economy of country Y grew between 2012 and 2022 according to the assumptions of guaranteed growth (warranted growth rate) of the Harrod-Domar model. In 2012, the total product of this economy was 200 billion euros and in 2022 it was 221 billion euros. During the same period, the average annual rate of savings was 20% and the average annual rate of depreciation was 4%. Calculate the value of this economy's physical capital stock in 2022.

$$\mathbf{r(Y)} = \left(\frac{221}{200}\right)^{\frac{1}{10}} - 1 = 0.01 = 1\% \quad \textbf{ou} \quad \mathbf{r(Y)} = \frac{\ln\left(\frac{221}{200}\right)}{10} = 0.01 = 1\%$$

Estimating the capital output ratio

$$\mathbf{g^w} = \left(\frac{\mathbf{s}}{\mathbf{v}}\right) - \boldsymbol{\delta}$$

$$0.01 = \left(\frac{0.2}{v}\right) - 0.04$$

$$\mathbf{v} = \frac{0.2}{0.05} = 4$$

Using the value of Y(2022) to estimate the value of K(2022)

From the Harrod-Domar physical capital equation

$$\mathbf{K = v * Y}$$

$$\mathbf{K = 4 * 221 = 884\ mil\ milhões}$$

Then value of physical capital in 2022 was 884 billion euros

2.2 (2 valores) Consider an economy that behaves according to a Cobb-Douglas aggregate production function with non-embodied technical progress (Hicks neutral), with constant returns to scale and with an elasticity of output in relation to physical capital of 0.5. Calculate the annual growth rate of output, knowing that the annual growth rate of total factor productivity was 1%, the annual growth rate of the number of workers was 0.5%, and the growth rate of the capital stock physical activity per worker was 1.5%.

From the growth rate of the physical capital stock per worker and the growth rate of the number of workers we can calculate the growth rate of the physical capital stock.

$$r\left(\frac{K}{L}\right) = 0.015$$

$$r(K) - r(L) = 0.015$$

$$r(K) = 0.015 + 0.005 = 0.02 = 2\%$$

Solving for Y:

$$\mathbf{Y = AK^{0.5}L^{0.5}}$$

$$\mathbf{r(Y) = r(A) + 0.5r(K) + 0.5r(L)}$$

$$\mathbf{r(Y) = 0.01 + 0.5 * 0.02 + 0.5 * 0.005}$$

$$\mathbf{r(Y) = 0.01 + 0.01 + 0.0025}$$

$$\mathbf{r(Y) = 0.0225 = 2.25\%}$$

The average growth rate of output is 2.25% per year.

GRUPO 3 (5 valores)

3.1 (2 valores) Consider an economy that behaves according to the Solow model and is in the steady state. Suddenly, due to a natural catastrophe, the stock of physical capital per worker suffers a significant reduction, falling to a level below that of the steady state, without altering the savings, depreciation or population growth rates of this economy. Indicate, justifying in detail, the implications of this reduction on the level and rate of growth of labor productivity in this economy, in the short and long term.

In the original steady state defined by k_0, the economy had a level of labor productivity y_0 and a zero rate of labor productivity growth. The referred shock implies that k=K/L falls below its initial level k_0, leaving the economy below the steady state. At that point, labor productivity y_1 will be less than y_0, but its growth rate will become positive, as the economy will fall short of the steady state, with a positive differential between the investment made and the investment needed. In the long run, the economy will find itself back at the steady state point defined by k_0, with y again equal to y_0 (since the fundamental variables that define the steady state have not changed). Once back to the steady state in the long run, the rate of growth of labor productivity will again be zero.

3.2 (2 valores) Consider a pay-as-you-go social security system where the average pension is 1000 currency units, the average labor productivity is 2500 currency units, wages account for 60% of output, the discount rate for social security on wages is of 30%, the total population is 10 million people, there are two workers employed for each pensioner and there are no other expenses or revenues other than pensions paid and deductions made. Check whether this system is currently financially balanced by submitting all calculations.

Condition of static equilibrium: w.b.L=P.Nr

b=0,3 ; P=1000 ; L/Nr=2 ; Y/L=2500 ; W/Y=0,6

(1) Y/L=2500 ⇔ Y = 2500.L

(2) W/Y=0,6 ⇔ W/2500.L=0,6 ⇔ W/L=0,6*2500 ⇔ w=1500

(3) w.b.L=P.Nr ? ⇔ w.b.(L/Nr)=P ? ⇔ 1500.0,3.2=1000 ? ⇔ 900 = 1000? False: the system is not balanced, as expenses are higher than revenues.

3.3 (1 valor) Briefly explain how a pay-as-you-go social security system works.

A pay-as-you-go social security system is a system in which the system's current revenues (salary deductions) are used directly to finance current expenditures (payment of pensions to which pensioners are entitled). This is the so-called principle of "intergenerational solidarity". Discounts are not accumulated or invested in any fund, but are used to pay pensioners directly. On the other hand, they confer the right to receive a pension in the future, which will in turn be paid by future workers' deductions. Only when there is a surplus of current revenues over current expenses is this surplus eventually subject to financial application.

GRUPO 4 (5 valores)

4.1. (2 marks) Explain why industrialization is important for economic growth.

Elements of the answer:

Development of the productive forces: new machinery, transport equipment, parts, intermediate materials, new processes of production, new skills and qualifications, new products and new resources, etc., which enable the incorporation of science and technology in production, circulation and research. These increase productivity in manufacturing and in all other sectors of the economy.

Transformation of social organization of production: specialization, division of labour, scale and scope, cooperation and coordination both vertical and horizontal, absorption of labour form agriculture, labour organization and conditions of work, articulating labour and production of different branches of industry, of different sectors of the economy and of different regions.

Current account balance, higher levels of income and of surplus value leading to higher and more sophisticated consumption and investment levels, dynamics and patterns.

4.2. (3 marks) Summarize Mariana Mazzucato's main arguments about "mission-oriented innovation" and discuss their implications for the design and implementation of industrial policies.

Elements of the answer:

"Missions" are measurable, ambitious and time-bound targets that have the potential to become one of the most significant vehicles for change and anchors around which actions for change are articulated, utilising state-of-the art scientific and technological knowledge to achieve major goals for the society as a whole. They work to tackle complex challenges such as

climate change, global health challenges, new and complex space missions, search for new and significant technological changes (such as the search for sustainable and cheap sources of energy), etc., by taking a purpose-oriented, market-creation and/or market-shaping approach, and require the participation of a large number of public and private economic agents, coordinated through effective but decentralized forms of control.

According to Mazzucato, "missions" help to tailor-make industrial policies to specific goals, stages of development and timeframes by providing a clear goal for industrial policy (the mission itself), which also becomes the anchor for mobilization and/or creation and articulation of different types of skills, capacities, agents, sectors of society and resources, within a defined timeframe. They help to define and establish the strategic focus of research and innovation and of finance, the relationship between and the roles of the State and of the private sector, the packages of incentives and subsidies, the institutional and regulatory framework, the systems of standards and quality, and so on, which are required for the mission to be accomplished.