Brown University
Department of Economics

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Summer 2021

Final Exam. Part 2: Open-ended questions

This is the 'open-ended' part of the final exam. There are 4 questions that worth 70 points (out of 100) combined. Please answer all questions below. For the 'essay' questions please submit typed answers (not handwritten!). In all questions, please follow the instructions at the beginning of a question. Good luck!

Question 1. The Solow Growth Model (20 pts)

Consider a version of the Solow model **with** population growth (but **without** productivity growth) discussed in Module 2. Production function is Cobb-Douglas with $\alpha = 1/2$. Assume that population growth rate $n = 0.02$, and depreciation rate $\delta = 0.03$. Level of TFP is $A = 2$, and the savings rate $s = 0.2$.

(a) Derive the equation for the steady state level of capital per worker, k_{ss} (show all the steps of how you arrived at your final equation). Find the specific value of k_{ss} for the given values of parameters (hint: you should get a whole number).

(b) Derive the equation for the steady state level of income per worker, y_{ss} (show all the steps of how you arrived at your final equation). Find the specific value of y_{ss} for the given values of parameters (hint: you should get a whole number).

(c) Depict k_{ss}, y_{ss} on the main diagram of the Solow model (with investment curve, depreciation curve (accounting for population growth rate), and income per capita curve).

(c) Explain how and why does y_{ss} depend on population growth rate parameter n (hint: answer is 'direction of the effect' + 'the reason why', i.e., the mechanism of how n affects stuff in the model, and eventually, affects y_{ss})

(d) Assume that n increases from 0.02 to 0.05. Find new values of k_{ss} and y_{ss}, and depict them, together with any shifts in curves (if necessary), on the main diagram of the Solow Model.

(e) Does the relationship between incomes per capita and population growth rates that you have just analyzed hold in the data?

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Question 2. The Malthusian Model (15 pts)

Consider a version of the Malthusian model we studied in Module 4. Namely, assume that $A = 1$, $X = 100,\ \alpha = 1/2$ in the production function, that parents spend one quarter of their incomes on raising children, and that the cost of raising one child is 1/2.

(a) Derive the equation for the steady state level of population L_{ss} (show all the steps of how you arrived at your final equation). Find the specific value of L_{ss} for the given values of parameters (hint: you should get a whole number).

(b) Derive the equation for the steady state level of incomes per worker y_{ss} (show all the steps of how you arrived at your final equation). Find the specific value of y_{ss} for the given values of parameters (hint: you should get a whole number).

(c) Suppose a country acquires additional territory because of a successful war against the neighboring country. This territory has additional productive agricultural lands, so X increases from 100 to 120. Find new level of L_{ss} for this enlarged country. Depict this change on the diagram with L_{t+1} on the vertical axis, L_t on the horizontal axis, and a curve that gives L_{t+1} as a function of L_t. Show both the new and the old steady state.

(d) What happens to population density in such a country in a steady state? (hint: think of population density as L/X). Do you expect such military expansions to boost productivity in the longer run?

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Question 3. (short essay) Institutions and Innovations (20 pts)

In this question, please limit your reply to the min of 1, max of 2 pages typed (12pt, single spaced, standard margins; graphs, figures, tables are welcome, but do not count towards the length). Other essay guidelines are the same as for the Assignment #3 in the course.

Consider the relationship between the quality of formal institutions (such as the rule of law and market entry barriers) and the rate of innovations in the economy. What are the potential effects of high entry barriers on innovations, and how do they operate (what are the mechanisms behind these effects)? What are the potential effects of property rights protection on innovations? Imagine you have a reliable cross-country data on the rates of innovation (say, patents per capita) and the height of entry barriers from Djankov (2002). What would you expect the sign of the correlation between the two variables be? Why? Please explain how the framework of Acemoglu and Robinson (2005) can help to link the two phenomena (institutions and innovations) (hint: consider the incentives and constraints of politicians in democratic and non-democratic regimes and how politicians reason when 'choosing' entry barriers).

Question 4. (short essay) Culture and Geography (15 pts)

In this question, please limit your reply to the min of 1, max of 2 pages typed (12pt, single spaced, standard margins; graphs, figures, tables are welcome, but do not count towards the length). Other essay guidelines are the same as for the Assignment #3 in the course.

Think about the persistence and change of various cultural traits. Would you say that culture is more persistent (harder to change) than institutions? Do you think that it's fair to say that certain countries and ethnic groups are poorer because of their culture is 'bad for growth'? What role has geography to play in persistence of development, and, in particular, in persistence of culture? Please explain how the paper by Galor and Ozak (2016), on the origins of long-term orientation, helps to illustrate the effects that geography can exert on culture. Does it provide any hints on how/why culture is persistent or flexible?