Graduate Macroeconomics I: Midterm 1

Prof. Vollrath

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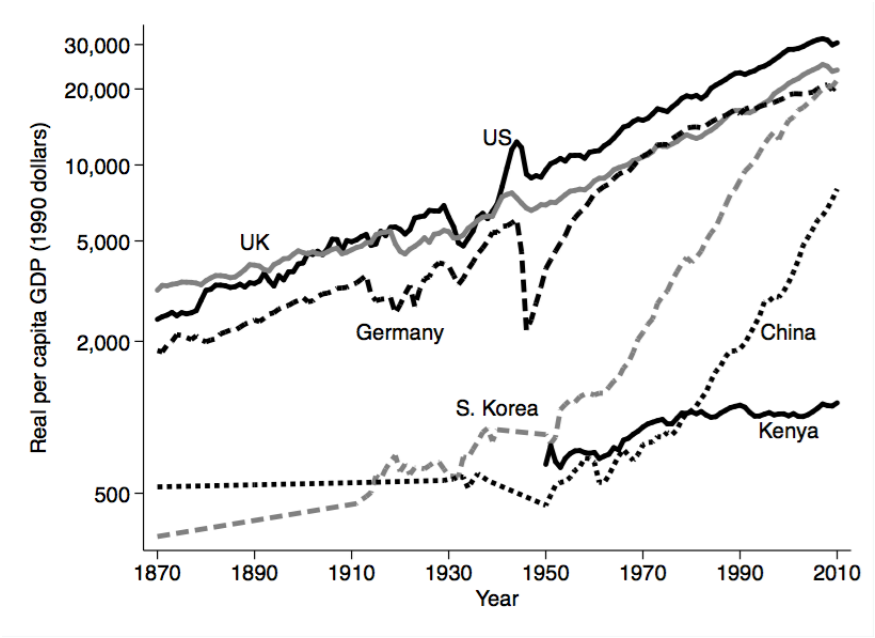
Instructions: Write your answers on blank paper. Start each problem on a new sheet. Write your name and the problem number of EVERY page. Number every page.

Read the whole problem before you start answering. Make sure you answer all the parts of each problem. If the problem asks you to graph something, graph it and label the axes correctly.

You have 90 minutes for the exam. Make sure you at least right down some ideas about how the problem should be answered if you cannot figure out a mathematical answer.

There are a total of 100 points.

Problem 1 (16 points): You have the following graph of output per worker for a set of countries. Thinking in terms of a Solow model, provide a plausible explanation for the time path of output per capita in China and Korea. There is no single right answer - but your answer must be logical within the context of the Solow model.



Problem 2 (16 points): You have a typical Solow model, with population growth n and depreciation δ. There is no productivity growth. Output is $Y = K^{\alpha}N^{1-\alpha}$. Savings are endogenous. When $y < \overline{y}$, savings are s_L. When $y \geq \overline{y}$, savings are s_H, with $s_H > s_L$. Describe all the possible steady states of the economy, including whether they depend on the value of $\overline{y}$.

Problem 3 (16 points): You have a colleague doing research that suggests that markups (μ) have been rising over the last 20 years, due to increased market power for firms. Explain what effect that had on the measured residual

$$Res = \frac{Y}{K^{1-s_n} N^{s_n}} \tag{1}$$

over this same period.

Problem 4 (16 points): Let both k and z accumulate according to typical Solow equations, with savings rates, depreciation and population growth. If $y = k^{\alpha} z^{\beta}$, with $\alpha + \beta < 1$, then there is a steady level of output per capita, but growth is zero in steady state. If $y = k^{\alpha} z^{1-\alpha}$, then there is a steady state growth rate different from zero, and output per capita rises continuously. Explain the intuition behind why these two production functions gives such different results.

Problem 5 (36 points): You have a Solow economy with population growth, n, depreciation, δ, and productivity growth. But productivity growth works slightly different than normal. Now,

$$\frac{\Delta E_{t+1}}{E_t} = \frac{g}{E_t} - \phi. \tag{2}$$

Production is typical, with $Y_t = K_t^{\alpha}(E_t N_t)^{1-\alpha}$. The initial level of productivity is $E_0 = 1$

(A) Analyze this model. Describe what happens to the growth rate as time goes from 0 to infinity.

(B) Draw a figure of the time path of output per capita from time 0 to infinity.

(C) There is a one-time positive shock to E at time k. Draw a figure showing how output per capita reacts to this shock, from prior to time k off until infinity.