

Ec 320, Fall 2009

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MIDTERM EXAMINATION SOLUTIONS

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Question 1 contains a series of short questions, the answers to which should be precise and brief. Credit is awarded for the reasoning underlying each answer, so yes/no responses by themselves will earn no credit.

1. ($6 \times 5 = 30$ marks).

(a) Would you agree with the statement that the Solow model predicts the effect of faster technical progress on growth rates of per capita income to be the same in the short run as in the long run?

ANSWER: Yes: the Solow model predicts the short run growth rate equals rate of TFP growth rate and the result of increased capital per worker, while the long run growth rate equals the TFP growth rate. So a rise in TFP growth rate raises growth rate of p.c.i. in both the short and long run by the same extent.

(b) Under what circumstances does the Solow model predict that countries with an initially lower level of per capita income will eventually catch up and overtake (the per capita income of) richer countries?

ANSWER: This will be true only if the poorer countries have a higher savings rate or lower population growth rate than the richer countries. Otherwise their p.c.i growth rates

will be higher only if their p.c.i. level is lower; once the p.c.i. levels are the same they will grow at the same rate, so they cannot overtake the rich countries.

(c) To what extent does the cross-country evidence for the Kuznets inequality-income depend on a particular inequality measure used in these studies?

ANSWER: It does not. Evidence based on the Kuznets ratio, the Gini coefficient, or shares of top and bottom deciles all show an inverted-U pattern in cross-sectional data. In panel data there is either no discernible pattern, or a slight tendency for inequality to decline, again irrespective of the precise measure used.

(d) Would you agree with the view that tariffs on food imports should be raised in order to speed up growth in poor countries operating in the early stages of the Lewis development process?

ANSWER: No. Raising tariffs on food imports would raise the cost of food, and hence urban wages, which would slow down growth.

(e) Provide an example of how the poverty gap ratio and income gap ratio may provide different answers to the question whether poverty has increased or decreased over time in any given society.

ANSWER: Suppose a country has four types of people in equal numbers, with incomes 50, 150, 400 and 4000, which change to 50, 100, 550 and 1300 respectively. Then with a poverty line of 200, the income gap ratio drops from $\frac{200}{1000} = 20\%$ to $\frac{250}{2000} = 12.25\%$. The poverty gap ratio rises from $\frac{200}{400} = 50\%$ to $\frac{250}{400} = 62.5\%$.

(f) What instrumental variables for height and BMI of Brazilian male workers were used by Strauss and Thomas in their study of the relation between wages and height, and how did these estimates compare with the estimates based on ordinary least squares regressions?

ANSWER: They used food prices and nonlabor income as instruments for height and BMI. This lowered their respective wage elasticity estimates from 4 to 2.4 and 2.2 respectively. So while it reduced the estimate considerably, it still remained large and significant.

2. (10 marks)

Explain and contrast predictions made respectively by the (a) Harrod-Domar, (b) Solow, and (c) Lewis models concerning the effect of higher population growth rates on the growth rate of per capita income. Make sure to distinguish short term and long term effects.

ANSWER: In the Harrod-Domar model, higher population growth unambiguously reduces growth of per capita income, in both the short and long run. In this model, per capita income is a linear function of capital per head (i.e. marginal productivity of capital is constant). So growth is caused by investment in capital goods which raises capital per head. The extent to which a given amount of investment increases the capital per head depends on the rate of population growth: higher population growth reduces the extent by which the amount of capital per head increases. Assuming zero depreciation, for instance, the rate of growth g of per capita income in the Harrod-Domar model is given by

$$g = \frac{\frac{s}{\theta} - n}{1 + n}$$

where s is the savings rate, θ is the capital output ratio, and n is the population growth rate. So the higher is n , the lower is g . Since the short run and the long run rate of growth are the same, the same effect operates on both.

In the Solow model, in the long run the amount of capital per head does not grow, owing to diminishing marginal productivity of capital. So the long-run rate of growth is always equal to the rate of technical progress, which is assumed to be exogenous, and thus independent of the savings rate. So there will be no effect of higher population growth on the long-run growth rate. In the short run, however, increases in capital per head do contribute to growth, if the country happens to be below the steady state amount of capital per head. Then for exactly the same reason as in the Harrod-Domar model, short run growth will be slower when population grows faster.

In the Lewis model, the effect depends on which phase the economy happens to be in. If it is in the first phase, higher population growth will hasten the onset of the second phase and thus slow down growth in the short run. This happens because higher population increases the demand for food, which drives up food prices (which in turn raises the cost of labor in

the modern sector, reducing migration, industrial profits and investment). Later, however, higher population growth relieves the labor scarcity that characterizes the transition from the second to the third phase. Hence growth at later stages is helped by faster population growth. Later in the third phase, the economy is like a Solow neoclassical economy, so the Solow predictions apply thereafter. In the long run, therefore there will be no effect on growth.

3. (10 marks)

Describe the empirical evidence available concerning the rate of return to education in developing countries based on micro-wage-schooling data. Cite specific studies and the methods they used and their main findings, and comment on what these imply for educational policy.

ANSWER: The main method involves estimating Mincer regressions of log wages on years of schooling, after controlling for age, education, region and occupation dummies. Ability bias is controlled by directly including measures of cognitive (reading, math scores) skills and ability tests (Raven's abstract thinking test) in the Mincer regression. The contexts include urban workers in a number of African (Kenya and Tanzania by Boissierre, Knight and Sabot (1985), Glewwe (1996) and Glewwe and Jacoby (1994) for Ghana, South Africa by Moll (1998)) and Asian (e.g., Pakistan by Alderman et al (1996)) countries.

The studies generally show a significant effect of math and reading scores, and an insignificant effect of the Raven score. The effect of schooling was significant when these scores were excluded, but became insignificant when they were included. This indicates that education raised wages by improving math and reading skills, rather than reflecting correlation with abstract ability. Hence the results are unlikely to be driven by ability bias.

The rates of return estimated for schooling in Ghana by Glewwe and Jacoby ranged from 4 to 6% in Ghana for the current educational quality, and much higher for investments in textbooks (6% plus), and double digits for blackboards and school building repairs.

However, Jolliffe's 1998 study of rural Ghana households showed that cognitive skills raised wages in urban areas, not in rural areas. Similar findings were obtained in Foster and Rosenzweig's work on the role of schooling in explaining rural wages in India, where

significant effects were found only in periods of rapid technological change. Hence the rate of return to education in rural areas in normal conditions appears to be not as high as in urban areas.

These studies indicate that investing in schooling (both expanding educational opportunity as well as quality of schooling) in urban areas should be part of a strategy of raising the growth rate of per capita income.