

Economics Department 2005 Honors General Exam

This is a 3-hour exam.* Each section of the exam (i.e., the micro section, the macro section, the econometrics section) is of equal point value. Thus you should spend roughly 1 hour on each section of the exam. In addition, each question within each section is of equal point value.

*For joint concentrators with economics as the secondary field: This is a 1-hour exam for you. Choose one section of the exam to complete. You will turn in your bluebook one hour after the exam begins.

You must answer **ONLY TWO** of the four micro questions. If you try to answer more than two micro questions, you will not get any credit for any work done on questions beyond the first two you try to answer.

You must answer **ONLY TWO** of the four macro questions. If you try to answer more than two macro questions, you will not get any credit for any work done on questions beyond the first two you try to answer.

You must answer **ONLY ONE** of the two econometrics questions. If you try to answer both econometrics questions, you will not get any credit for any work done on the last question you try to answer.

You must use a **SEPARATE** blue book for each question, so you will hand in five (5) bluebooks. Make sure your name and the question number (Micro 3, Macro 1, etc.) are on the outside of each of the five bluebooks! The number should refer to the actual question number on the exam.

Calculators are **NOT** permitted. Econometrics Cheat-Sheets are **NOT** permitted, nor are any cheat-sheets.

Good luck!

Micro Question 1

To finance the Social Security system, workers are assessed a payroll tax of 6.2% on their labor income up to \$90,000 per year; earnings above \$90,000 are not subject to this tax. (Employers also pay 6.2% on earnings up to \$90,000 for each worker, but we will leave that aside for this question). Among the policy options suggested for addressing the fiscal imbalance in the Social Security system is to increase the taxable payroll. Suppose that the amount of earnings subject to the Social Security payroll tax is raised to \$140,000. For simplicity, focus only on the payroll tax side of the Social Security system (ignore benefits), and assume that there are no other taxes.

- a. On a well-labeled graph showing leisure on the horizontal axis and goods on the vertical axis, show the annual budget line for a representative worker (i) in the absence of the payroll tax, (ii) when the taxable payroll is \$90,000, and (iii) when the taxable payroll is \$140,000. You may assume that goods cost \$1 per unit. Also, assume that if the representative worker chose to work the maximum number of available hours in the year at the market rate w , he or she would earn more than \$140,000. Be sure to label the slope of each segment of the three budget lines and the amount of goods associated with any kinks in the budget lines.
- b. Assuming that leisure is a normal good and that the worker's preferences can be described by an indifference map of the usual downward-sloping, convex-to-the-origin variety, explain how the worker will adjust labor supply when taxable payroll is increased from \$90,000 to \$140,000, if he or she initially (i.e., with taxable payroll equal to \$90,000) earns (i) less than \$90,000, (ii) between \$90,000 and \$140,000, and (iii) more than \$140,000. Explain your answers carefully.
- c. When the taxable payroll is \$140,000, would you expect a worker to earn exactly \$140,000 in the market? Explain your answer.

Micro Question 2 (New Blue Book)

One of the major results of microeconomic analysis is the following theorem:

If all goods are private (that is, any unit consumed by one person or used in the production process of a single firm is not available to others and has no indirect effect on other economic agents) and are traded in perfectly competitive markets, the allocation of resources in the economy will be Pareto efficient (sometimes referred to as “Pareto optimal”).

- a. What is a market and what role do market prices play in an economy?
- b. What do we mean by Pareto efficiency (or Pareto optimality)? What conditions must hold if an allocation of resources and goods in an economy is to be judged as Pareto efficient? Provide an intuitive explanation of what each of these conditions means.
- c. Explain how perfectly competitive markets imply that the necessary conditions for Pareto efficiency will be met.
- d. In many cases, environmental pollution is not traded in markets. Explain how the absence of a market for the pollution caused by certain production processes implies that the allocation of resources in the economy will not be Pareto efficient.

Micro Question 3 (New Blue Book)

Assume that everyone works at the center of a city and lives around that city.

- a. If everyone is identical (except for their location) what will determine the extent to which housing prices and housing density changes with distance from the city center? Will the housing price gradient (i.e., the extent to which housing prices decline with distance from the city center) be convex or concave?
- b. If there are rich people and poor people, under what circumstances will the rich people live closer to the city center than the poor people?
- c. If everyone is identical (except for location) and if everyone consumes exactly one unit of land, and if there are multiple modes of transportation, will the housing price gradient be convex or concave? Give a proof.

Micro Question 4 (New Blue Book)

Assume a homogeneous population of size N , and a prevailing wage of W , and assume that the government must hire S people to be soldiers. The government has the ability to raise lump sum taxes of any size.

- a. What determines the wage that the government must offer to a volunteer army?
- b. If the government decides to raise the army by running a draft, what will the optimal wage be for soldiers in this case? Will overall utility be higher in this case or in the case with the volunteer army?
- c. How can private lotteries achieve the same result as the draft?
- d. How are these results changed if people are heterogeneous?

Macro Question 1 (New Blue Book)

Analyze the following pseudo-quotation by answering the questions below. For each part, provide analysis based on economic models. In all cases, a few sentences and a couple of well-chosen equations or graphs will suffice.

“The relationship between productivity growth and economic performance is often the subject of hot debate. Manufacturing workers often assert that higher productivity growth costs jobs, a conviction that many workers have held since the time of the Luddites. They say that each factory produces to meet the demand for a fixed number of goods, so higher productivity leads to layoffs. But economists generally oppose this view adamantly. They point out that since the time of the Luddites—the early Industrial Revolution—productivity has grown almost 100-fold, but many more millions of people are employed now than were employed then. To take a less long-term view, productivity in the U.S. has grown dramatically since the mid-1980s, but the unemployment rate has gone down somewhat over the last 20 years. Still, however, a small group of economists is staking out a new position somewhere between the traditional views of laymen and economists. They argue that productivity growth does indeed appear to cost jobs, but only in the short run. As an example, they point to data from the late 1990s and early 2000s. In the boom years of 1998-2000, productivity growth averaged 2.8 percent. Productivity growth was much higher—4.4 percent—for both 2002 and 2003, but the unemployment rate was also higher in those years than in the late 1990s.”

- a. Do you agree with the traditional economic view that in the long run a higher level of productivity raises output and consumption? Why or why not?
- b. In the long run, does a higher level of productivity change the unemployment rate? What assumptions are key for getting your result?
- c. Economists often call the factory workers’ assumption of a fixed demand for goods “the lump of output fallacy.” How would you explain to a non-economist why it is a fallacy? That is, why will an increase in productivity lead—in the long run—to an increase in the demand for goods as well as the supply of goods?
- d. Sketch a formal economic argument why the “new view” of economists might be right, i.e., why higher productivity might lead to higher unemployment in the short run only. In your explanation, why would the result be different in the long run?

Macro Question 2 (New Blue Book)

Consider an economy with the production function:

$$Y = AK + BL$$

where K and L are the levels of capital and labor, $A > 0$ and $B > 0$. The saving function is sY , where $0 < s < 1$. Capital depreciates at rate d and the labor force grows at rate n . Assume that $sA = n + d$.

NOTE: The production function here is not the usual one. Do all derivations and draw diagrams based on the production function in this problem, NOT the usual one.

- For this production function, find $f(k)$, the expression for output per worker (Y/L) as a function of capital per worker (K/L).
- Write the equation for the growth of capital per worker, k , in terms of $f(k)$ and other variables. (You do not need to derive this equation, but explain the intuition briefly.) Substitute your result from part (a) for $f(k)$.
- Draw the saving function and the “per-capita depreciation” (break-even investment) line for this problem. Explain why the picture differs from the usual one.
- Is there a steady-state capital stock in this model? Why or why not?

Discuss the following statement in the next two parts:

“Growth theory predicts that changes in saving rates will have only temporary effects on the long-run growth rate of the economy. Ultimately the only growth in living standards comes from changes in the ‘efficiency’ of labor, which economic theory cannot explain.”

- Do you agree that in the standard Solow model, a change in the saving rate has only a temporary effect on economic growth? Explain your answer.
- Do you agree that in the model presented in this question, a change in the saving rate has only a temporary effect on economic growth? (For this part only, you may relax the assumption that $sA = n + d$.) Explain your answer.

Macro Question 3 (New Blue Book)

What are the determinants of convergence or divergence between countries?
Discuss different approaches.

Macro Question 4 (New Blue Book)

What are the limits of growth models that emphasize capital accumulation as the main source of growth? Discuss alternative approaches.

Econometrics Question 1 (New Blue Book)

a. This question was inspired by “Lifetime earnings and the Vietnam Era draft lottery: Evidence from social security administrative records,” by Josh Angrist. We want to evaluate the causal effect of serving in the military in the Vietnam War on long term earnings. We have a cross section of men born in 1952 and we observe their earnings in 1980. Let $earn_i$ denote the earnings of person i in 1980 and let $veteran_i$ be a dummy equal to 1 if he served in Vietnam. Our model is

$$earn_i = \mathbf{b}_0 + \mathbf{b}_1veteran_i + u_i.$$

Some men choose to serve in the military and some are drafted. Perhaps people who expect to get the most out of military service will choose to join. Perhaps people who choose to join have relatively few civilian opportunities. Perhaps people who tend to serve in the military are less able to get deferments from the draft than politically connected people. We want to estimate \mathbf{b}_1 , the causal effect of serving in Vietnam on earnings. Define this causal effect. Will a least squares regression of $earn_i$ on $veteran_i$ deliver an unbiased estimate of the causal effect? Explain.

b. Many of the people who served in Vietnam were drafted. Let RSN_i denote the random sequence number of person i . RSN was a random number from 1–365 assigned by birthdays. People born on January 1 randomly got one number, people born on January 2 randomly got another, and so on. Each year the military announced a cutoff number, and everyone with a RSN below that cutoff had to report to a draft center. Not all those who reported were drafted - many were able to get deferments based on getting an advanced degree or perhaps from political connections. In 1972 the cutoff was 95, so everyone with a number of 95 or lower was draft eligible and had to report to a draft center. Let E_i be a dummy equal to 1 if a person was eligible for the draft, so their number was below the cutoff. Explain how to use E_i to estimate \mathbf{b}_1 , the causal effect of serving in Vietnam on earnings. Explain in some detail how you would construct your estimator, and discuss how you would compute the standard errors. What do we need to assume about E_i in order for your estimator to be consistent?

c. It may be that the effect of serving in Vietnam differs depending on your race. Let $black_i$ denote a dummy equal to 1 if the person was black, and zero otherwise.

Explain how to use $earn_i$, $veteran_i$, $black_i$ and E_i to test whether the causal effect on earnings of serving in Vietnam differs by race. Please explain your approach in some detail.

d. Let D_i denote a dummy equal to 1 if the person was drafted. The *RSN* numbers were usually announced months before the cutoff number was announced. Therefore people with low numbers knew they would probably be drafted, and people with high numbers knew they didn't have to worry. As a consequence of this delay, many men with low numbers volunteered for the military to avoid being drafted and to improve their terms of service. In addition, many men who were drafted did not serve because they failed military screening exams. For example, in 1970 half of all registrants failed pre-induction examinations. If we wish to estimate the causal effect of serving on earnings, do you think D_i is a sensible instrumental variable for *veteran*? Explain.

Econometrics Question 2 (New Blue Book)

a. Provide a derivation of the omitted variable bias formula.

b. Discuss the identification problem in estimating demand and supply curves from data on price and quantity. How is this related to omitted variable bias? What sort of information would be helpful in solving the identification problem? Explain how this information could be used and provide some justification for your procedure.