WRITTEN PRELIMINARY Ph.D EXAMINATION

Department of Applied Economics

Trade, Development and Growth

For students electing

New Trade Theory (8702) & Micro (8703) option

Instructions

- Identify yourself by your code letter, not your name, on each question
- Start each question's answer at the top of a new page
- You are requested to answer a total of FOUR questions
- Answer ONE question from Set One
- Answer THREE questions from Set Two
- You have four hours to complete this examination
SET ONE

Required Question: Answer ONE Question (I or II but not both)

I. Trade Theory: Income Distribution.

What are the effects of going from autarky to free trade on income distribution? Answer this question using at least two trade models (e.g., Heckscher-Ohlin, Ricardian, Specific Factors, Standard Trade Model). Be sure to consider:

(a) Returns to factors within countries (e.g., rents, wages)

(b) Welfare across the countries (e.g., utility)

(c) How your answers depend on whether you’re evaluating the long run or short run.

II. Technology adoption, limited liability, and insurance among agricultural households.

For this problem you will investigate whether farmers with limited liability would benefit from being offered insurance. To start, consider a farmer who can choose between planting hybrid seeds or traditional seeds. The output from traditional seeds is $Y_T$. The output from hybrid seeds is $Y_H$ with probability $p$ and $Y_L$ with probability $1-p$, where $Y_H > Y_L$ and $0 < p < 1$.

(a) Suppose that farmers vary in their risk aversion, with some being more risk averse than others. Assume that farmers have different utility functions, but each farmer has a utility function that is strictly increasing in crop yield, and depends only on crop yield. You observe that some farmers choose the traditional variety while others choose the hybrid variety. If the input costs are the same for both varieties, what does this imply about the size of $Y_T$ relative to the sizes of $Y_H$ and $Y_L$? Your answer should be very brief, using logic rather than math.

(b) Next, assume that there is a cost to planting the hybrid varieties: the seeds have to be purchased at a cost, denoted by $C$. Farmers have no money to buy the seeds, so if they want to plant hybrid seeds, they have to borrow at an interest rate, $r$. Thus, the cost of the seeds (the amount farmers have to repay for the loan) is $(1+r)\times C$. For notational simplicity, let $R = (1+r)\times C$. Finally, the farmer also has assets, denoted by $W$, and a utility function, $U(\cdot)$. $U(\cdot)$ depends only on income from crop yield (the price of the crop is normalized to equal 1) plus the value of assets. For example, the utility from planting traditional varieties is $U(Y_T + W)$. Assume that $Y_L > R$, so that the farmer has enough money to pay back the loan even if he has a low harvest. What is the (expected) utility of the farmer from planting hybrid seeds?
(c) Next, consider the case where $Y_L < R$. In this case, to repay the loan in the event of a low output the farmer will have to use some or all of his or her assets ($W$) to repay. Yet it may be hard for the lender to force the farmer to use assets to repay the loan. Assume that the lender can always force the farmer to pay from output (either $Y_L$ or $Y_H$), but the probability of the lender getting paid from the farmer’s assets is $\phi$, where $\phi < 1$. Assume that $Y_H > R$, so that the farmer can repay the loan when he or she plants the hybrid varieties and the output equals $Y_H$. But if the output is low, the farmer cannot repay out of $Y_L$ alone, and so the lender “confiscates” $Y_L$, and the lender also has a probability $\phi$ of obtaining the rest of the payment $(R-Y_L)$ from $W$. (Assume that $W > R$.) In this case, what is the (expected) utility of the farmer from planting hybrid seeds? [Note: Assume that probabilities $p$ and $\phi$ are independent.]

(d) Next, lenders start to offer a package that combines both credit and rainfall insurance. Rainfall can be low ($\ell$) or high ($h$), and the probability of high rainfall is $q$. The cost of the insurance is $\pi$. If rainfall is low, the insurance pays the farmer $(1+r)(C+\pi)$, which we will denote as $R^l$. If rainfall is high, the farmer gets no insurance payment. Note that insurance payments depend only on rainfall; they do not depend on output. Assume that the price of the insurance is “actuarially fair”, so that the expected profit to the lender (and expected return to the farmer) is zero. Use this assumption to express $\pi$ as a function of $C$ and $q$. [Hint: Express the insurance cost in terms of the value at the time when the insurance is paid, i.e. the cost is $(1+r)\pi$.] Also, express $R^l$ as a simple function of $R$ and $q$.

(e) Assume that $p = 0.5$ and $q = 0.5$. Also, assume that the corr$(p, q) = \rho$. For binary variables $p$ and $q$, this implies the following:

\[
\text{Prob}[Y_H \text{ and } h] = (1/4)(1+\rho)
\]
\[
\text{Prob}[Y_H \text{ and } \ell] = (1/4)(1-\rho)
\]
\[
\text{Prob}[Y_L \text{ and } h] = (1/4)(1-\rho)
\]
\[
\text{Prob}[Y_L \text{ and } \ell] = (1/4)(1+\rho)
\]

What is the expected utility for someone who adopts the hybrid seeds and takes an insured loan? Assume the same situation as in part c) above; if the low state occurs, assume that $Y_L < R^l$, and assume that, with probability $\phi$, the farmer must use his or her assets ($W$) to pay the full loan, but with probability $(1-\phi)$ the farmer can keep his or her assets. Assume that $\phi$ is independent of both $p$ and $q$. For later convenience express your answer using $R$, instead of $R^l$, using your answer to d). [Hint: Your answer, when simplified, should be the sum of 5 parts, each of which has a utility function expression in it, and the only terms in the utility function should be $Y_H$, $Y_L$, $R$, and $W$.]
(f) Suppose that output is always high if rainfall is high, and output is always low if rainfall is low, which implies that \( \rho = 1 \). Further, assume that low rainfall implies a complete crop failure, so that \( Y_L = 0 \). Using your answers to c) and e), are there some values of \( \delta \) for which the farmer would prefer an uninsured loan to an insured loan? Give some economic intuition for your answer.

SET TWO:

Answer THREE of the following four questions (III to VI)

III. Trade Theory: Evolution.

Consider the evolution of trade theory. Over time, four distinctive bodies of literature have emerged, including: Traditional Theories of Comparative Advantage, Factor-Content Theories, New Trade Theories, and Trade and Multinationals Theories.

(a) What are the key assumptions of each body of literature?

(b) What real-world observations prompted the initiation of each body of literature?

(c) What are the implications of each body of literature for theory predictions in terms of gains from exchange, patterns of exchange, and protectionism or liberalization.


Use your knowledge of the welfare effects of the trade policies below to explain why policy makers interested in maximizing national and world welfare support free trade while select agents within countries (e.g., consumers, government, firms) do not support free trade. Support your analysis with illustrations.

(a) Tariffs

(b) Export subsidies

(c) Quotas or bans

V. Returns to R&D

Using standard welfare surplus approaches (and using clearly and carefully labeled graphs), illustrate and explain the following

(a) Assuming a closed economy, with a research-induced reduction in the unit cost of production that results in a parallel shift on aggregate supply, domestic consumers always experience a welfare gain at the expense of domestic producers. True or false, explain.
(b) The estimated total benefits from supply shifting R&D are especially sensitive to variations in the estimated price elasticity of demand. True or false, explain.

(c) Producers might be expected to pay for all the cost-reducing research in an innovating country that is small-in-trade. True or false, explain.

(d) In a large country-in-trade setting, absent international transfers of technology, if an importer innovates the rest-of-world unambiguously experiences a reduction in consumer welfare. True or false, explain.

VI. Measurement of Poverty

This question is a series of more specific questions on how to measure poverty, with some references to inequality measurement.

(a) To measure the extent of poverty in a given country at a given period of time, you need to make three decisions about how you are going to measure poverty. Briefly describe the three things that you need to make a decision on. Of these three, which one is not needed when you are deciding how to measure inequality?

(b) As discussed in class, the Foster-Greer-Thorbecke poverty index can be defined as follows:

\[ P_\alpha = \left( \frac{1}{n} \sum_{i=1}^{n} \left( \frac{k_i}{z} \right)^\alpha \right) \text{ where } k_i = 0 \text{ if } y_i \geq z \]

\[ k_i = z - y_i \text{ if } y_i < z \]

where \( n \) is the number of people, \( y_i \) is the income of person \( i \) and \( z \) is the poverty line. For what values of \( \alpha \) will this poverty index increase if income inequality is higher among the poor? Just give a brief answer, without explaining it.

(c) Next, prove your answer to part b). Explain what a Pigou-Dalton transfer is, and show that, for the values of \( \alpha \) in your answer to b), a Pigou-Dalton transfer among two poor people will increase inequality. [Hint 1: Consider 2 people, A and B, where \( y_A < y_B < z \), and see what happens when a small amount, \( t \), is taken from person A and given to person B. Hint 2: Use differential calculus to see what happens to the Foster-Greer-Thorbecke index when \( t \) is increased by a small amount.]

(d) Your answer for c) shows that, for certain values of \( \alpha \), the Foster-Greer-Thorbecke poverty index is sensitive to inequality among the poor. This suggests that, if the poverty line is set high enough so that everyone is poor, this index may be a good measure of inequality. To see whether it is a good inequality index, check whether, for the range of \( \alpha \) in your answer to c), this index satisfies the population independence axiom and the mean independence axiom that good measures of inequality should satisfy. Assume that the poverty line (\( z \)) is set so
high that everyone is poor, even after people's incomes are changed (when checking the mean independence axiom). [Hint: for the population independence axiom, suppose that for every person in the original population there are now m people with that person's income, where m is an integer that is > 1.]

(e) Based on your answer to d), is the Foster-Greer-Thorbecke a potentially useful measure of inequality for certain values of α? Explain the intuition behind your answer.