University of California, Davis
Department of Agricultural and Resource Economics

M.S. Comprehensive Exam
August 18, 2008

You have four hours to write this exam plus a 20 minute reading period (8:30 – 12:50). You do not need to use the whole time period. This exam consists of six questions and is divided into three parts. Read the following directions carefully and follow them exactly.

Part 1 consists of Question 1. You MUST answer question 1. It represents 30% of your grade.

Part 2 consists of Questions 2, 3, and 4. You MUST answer two of these three questions, but do not answer all three. Each question here is worth 20% of your score, so Part 2 is worth 40% in total.

Part 3 consists of Questions 5 and 6. You MUST answer one of these two questions, but do not answer both. Each question here is worth 30% of your score, so Part 3 is worth 30% in total.

Be sure to allocate your time wisely given this information.

The logic used to answer each question is important, so be sure to clearly specify your reasoning, using full sentences. Supporting your answers with diagrams and/or equations is also important. Make sure your writing is legible. Unreadable answers are assumed to be wrong.
PART 1: YOU MUST ANSWER QUESTION 1.

1. Most goods (e.g., wine, cars, etc.) have multiple attributes (e.g., sugar content, engine size, etc.) – each of which may be valued differently by consumers. Applied economists often use hedonic price regressions to estimate the value consumers attach to these various attributes of a good. A hedonic price regression includes the price of the good as the dependent variable and attributes of the good as independent variables.

Below are hedonic price regression results from a sample of 782 different types of olive oil available in European markets. The dependent variable is price in Euros per 0.5 liter. Note that Europe uses International Olive Council standards for determining whether a particular olive oil qualifies as “extra virgin”: the oil must be processed in a certain way and must have no taste defects.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Degree of Acidity (mean=0.58)</td>
<td>-1.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Extra virgin dummy (1 if certified as extra virgin, 0 otherwise)</td>
<td>1.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Italian origin dummy</td>
<td>0.7</td>
<td>0.1</td>
</tr>
<tr>
<td>Greek origin dummy</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Spanish origin dummy</td>
<td>0.3</td>
<td>0.05</td>
</tr>
<tr>
<td>Glass bottle dummy (1 if sold in glass bottle, 0 otherwise)</td>
<td>1.2</td>
<td>1.4</td>
</tr>
</tbody>
</table>

| N=782                                         | R²=0.67     |

a. Interpret these econometric results in words. As you discuss these results, carefully assess the statistical and economic significance of these estimates.

b. Formulate null and alternative hypotheses to test whether consumers are willing to pay extra for extra virgin certification. Derive a test statistic from these results to test this hypothesis and interpret the result of this test.

c. Formulate null and alternative hypotheses to test whether consumers distinguish and discriminate between olive oil from different origins. Discuss carefully how you would test this null hypothesis, including the test statistic you would use.

d. Suppose Greek olives tend to have relatively high acidity, while Spanish and Italian olives tend to have lower acidity. Describe why this matters for the validity and interpretation of this hedonic price regression.

e. The U.S. does not currently regulate or certify what qualifies as extra virgin olive oil. As a result, there is substantial consumer confusion about what the term extra virgin means on an olive oil label. You have been given access to
the data used in the regression above and have collected data from an additional 700 types of olive oil in the U.S. market. Specify a single, flexible regression model you could estimate from the pooled European and U.S. data to test whether and how Americans and Europeans are different in their hedonic valuation of olive oil.

f. The California legislature is currently debating a bill that would impose International Olive Council standards for any extra virgin olive oil sold in California. Suppose the bill passes and these standards are effective January 1, 2009. Suppose further that you could track the prices of 300 types of olive oil sold in California each year from 2008 to 2013. Specify and discuss a model you could estimate in 2014 using these data to determine how California’s adoption of extra virgin standards has changed consumer valuation of extra virgin olive oil over the period 2008 to 2013.

g. In general, what market assumptions must hold in order for hedonic price regressions to offer meaningful insights into consumers’ marginal valuation of attributes?
2. Suppose a farm labor union is investigating a sector of California agriculture that produces an edible widget, using labor as a major input. The labor union has asked for your economics advice on whether it should try to organize workers in this sector and attempt to raise their wages, as the workers are complaining about low wages. You determine that you must first study the characteristics of the demand for labor in this sector before providing advice to the union.

Assume that labor costs are a large share of production costs in this sector, and the other major input is energy. In the production process, it is relatively easy to substitute energy for labor. Further, assume that the price elasticity of demand for the final product (edible widgets) is relatively high, as there are a number of substitutes available to final consumers.

a. For this sector, explain how you would derive a rough estimate of the own wage elasticity of demand for labor, defined as the percentage change in its employment given a 1% increase in the wage rate. Explain theoretically what functional relationships you would need to represent and estimate in order to compute such an elasticity, and whether your theory and intuition provide insights about the size of such an elasticity. If you need to make additional assumptions to answer this question, please state them clearly.

b. Draw the supply and demand curves for labor in this sector. Indicate clearly how your estimate of the elasticity of demand for labor corresponds to what you show in the diagram. Then using this diagram, indicate the economic effects on wages and employment of any attempt by the union to try and raise wages. Clearly state your final recommendation to the union’s leadership.
3. In 2008 we are experiencing a significant commodity price boom. Grains and oilseeds have doubled or tripled in price in the past 18 months and livestock prices are now starting to increase, up about 25% in the past 6 months.

Argentina is an important exporter of beef, soybeans, wheat and other agricultural products. In response to the recent increase in global agricultural commodity prices, Argentina has imposed high export taxes on agricultural products. The export tax on many agricultural products now exceeds 40% in Argentina.

a. Why do you suppose that Argentina’s government would decide to tax agricultural exports? Please explain in detail who in Argentina would gain and who would lose from such a tax, in terms of economic welfare. What about the net economic effects on the country as a whole? Feel free to use graphs and/or algebra as part of your answer. As you make certain assumptions in arriving at your answer, please state them clearly.

b. If the government of Argentina implemented the export tax to try and correct what they perceive as a “problem” in the domestic market, do you think that use of a “domestic” policy instrument rather than a “trade” policy instrument (i.e., the export tax) would have been a better or worse choice from an economics perspective? Please answer which is better—a domestic or a trade policy instrument—and explain your answer, including the criterion used for ranking the two policy options.

c. Finally, what impact do you suppose the export tax might have on world markets for the commodities in question? Please use clear economic logic in answering this question and give precise reasoning.
4. Both federal and state laws in the U.S. allow agricultural industries to undertake joint action, if they choose, through what are known as marketing orders. This question will examine one of the functions that can be performed under the authority of marketing orders, generic advertising.

a. Generic advertising works by collecting a tax per-unit-of-production from farmers (i.e., an excise tax) and using the funds collected to promote the product. Use a simple graphical model of a competitive market to illustrate how a generic advertising program will affect the market. Consider effects on both demand and supply. Explain your graphical analysis in words.

b. A key question for producers is whether generic advertising programs are “effective.” Suppose you were the owner of a large agricultural firm and had concerns whether the funds you were contributing to the generic advertising program represented a wise investment. Use your graphical model to develop a conceptual basis to evaluate a program’s success. Depict graphically a program that is (i) successful and (ii) unsuccessful, based upon your framework.

c. Ultimately the impact on demand of any generic advertising program is an empirical question. Sketch an econometric approach to estimating a program’s effectiveness. As part of your answer, (i) set forth equation(s) you would estimate, (ii) indicate data you would need to conduct your estimation, and (iii) discuss any econometric issues/problems you believe you would encounter. Make sure your answer in (iii) is tailored to this problem and does not represent a mere recounting of problems you know exist in econometrics.
PART 3: ANSWER EITHER QUESTION 5 OR QUESTION 6. DO NOT ANSWER BOTH.

5. High gas prices have directed attention to consumers’ vehicle purchases in terms of fuel economy. Of course, we all prefer vehicles that get better gas mileage, ceteris paribus, but poor gas mileage generally means more of other things, such as safety, space, engine size, that many consumers value. Thus, we can say that automobiles are a horizontally differentiated product as it pertains to gas mileage per gallon, when we recognize that mileage serves as a proxy for other vehicle attributes.

We will consider a model with the following assumptions:

(i) Consumers are distributed uniformly with respect to their preference for automobile gas mileage along the interval \([a, b]\), where \(a < b\).

(ii) Three types of cars exist: Type A is low mileage (e.g., Hummer), Type C is medium mileage (e.g., Camry), and Type B is high mileage (e.g., Prius). Types of cars are located along the interval \([a, b]\) based upon their mileages as follows: \(A = a\), \(B = b\), and \(C = c\), where \(a < c < b\).

(iii) Auto makers compete in prices, and there are \(N \geq 2\) brands at each location.

(iv) Manufacturers’ cost per vehicle is constant per unit and is the same for all manufacturers of a given vehicle type. The ranking of costs by vehicle type is as follows: \(0 < C_C < C_B < C_A\).

(v) Consumers’ purchase either one car or none. Utility is \(U = \mathbb{E} - tx\), and net surplus from purchasing an automobile is \(U - P\), i.e., \(A, B, C\). Consumer surplus if no automobile is purchased is \(U = 0\), where \(x\) is the distance in the miles-per-gallon space of the car, relative to the consumer’s preferred type, and \(t > 0\) is the utility cost per unit of mileage distance.

a. Draw a diagram of this market, assuming Bertrand-Nash competition among auto manufacturers and noting particularly assumption (iii). Structure your diagram so that each consumer purchases a vehicle in equilibrium, i.e., the market is covered. Your diagram should include (i) the locations of each vehicle type, (ii) the price of each vehicle type, and (iii) the market area (demand) for each vehicle type. (HINT: Using a Hotelling model is a very good idea.)

b. On the same diagram as you drew for part (a), depict the equilibrium with \(t' > t\) such that the market is not covered.

c. A more realistic description of the car market would incorporate that consumers’ costs include both the purchase price of an automobile and the costs of operating it. With this thought in mind, and maintaining other assumptions, discuss how higher gas prices will affect this auto market. A diagram may be helpful, but is not absolutely necessary.
d. Carbon emissions from an automobile are inversely related to the car’s gas mileage. Assume carbon emissions are bad for society, and discuss in words the societal problem created by these emissions. Then consider the following two possible policy responses to this societal problem:

- Miles-per-gallon standard: All vehicles must meet a mileage standard \( s > a \).
- Vehicle subsidy: Anyone who purchases a vehicle that gets at least \( \tau \) miles per gallon, where \( c < \tau < b \) receives a subsidy of \( \kappa > 0 \).

Indicate how each of these policies addresses the societal problem and affects the car market. Try to make specific predictions of impact for the endogenous variables in your graphical model. Again, drawing graphs is probably helpful but not absolutely necessary.
6. Demand estimation.

a. Define and discuss the following restrictions as implied by demand functions from either consumer theory (final goods) or producer theory (inputs). For each of the four categories below, define the restriction and identify a theoretical assumption from which the restriction follows.
   i) Adding up
   ii) Homogeneity
   iii) Symmetry
   iv) Negativity

b. Using either consumer or producer theory, discuss how each of these restrictions relate to both the demand functions and the optimization process that generates these functions. (For example, for the producer, what is the optimization model that results in the input demand equations and how do the restrictions in (a) relate to both the optimization model and the demand equations?)

c. If you assumed a particular functional form for the function you were optimizing over in (b), how would you construct an equation (or equations) to represent the demand functions? (For example, how might you specify input demands from a cost function for producer theory or commodity demand from an AIDS model for consumer theory?)

d. How would you estimate such a model? In particular, what parameter restrictions might be implied by the adding-up and symmetry restrictions, and would this affect how you would estimate the demand model?

e. Describe how theory can be used to formulate empirical tests of at least two of the restrictions listed in (a).
University of California, Davis

Department of Agricultural and Resource Economics

M.S. Comprehensive Exam, July 2, 2009

You have four hours for this exam after a 20 minute reading period (8:30-12:50). You do not need to use the whole time period. Each of the three questions should take about one hour, so you have one hour extra if you need it.

Choose one question from each of the two following sections to answer. Everyone must answer the one question in the third section.

Watch the time carefully; each question (but not parts of each question) count equally, so don’t get bogged down with any one. The logic used to answer the question is important, so be sure to clearly specify your reasoning, with full sentences. Supporting your answer, usually by diagrams or equations, is also important. Make sure your writing is legible; if we can’t read it, it will be assumed wrong.

SECTION I: Choose either question #1 OR question #2 to answer

1. In many industries plants and firms are getting larger, resulting in increased concentration. In such a case, perfect competition models are not amenable to analyzing firm behavior, but some type of imperfect competition must be assumed.

   Policy concerns about monopolistic or oligopolistic behavior have been raised in many industries, including in food processing industries. In particular, lawsuits have recently been filed against milk processing firms, claiming that they have exercised monopoly power against retailers. In this question I will ask you to work through generally how you would adapt a perfectly competitive theory of firm behavior to represent, and ultimately estimate, such market power.

   You don’t need to derive everything – you won’t have time. The trick will be to identify the key graphs and/or equations relevant to this question, and to explain how you would use these tools to analyze whether milk processors might be exerting monopoly power.

   a) Graphically (in diagram form) and/or analytically (in equation form), explain how economists represent firms’ input demand and particularly output supply choices in perfectly competitive markets – in this case for the milk processing firm(s), assuming that they are profit-maximizing firms. Explain briefly their underlying constraints, optimization problem and choices. (hint: one way you could do this is through a profit function).
b) What assumption(s) in this model would be invalid if you were trying to determine the extent of market power in an oligopolistic industry, and how would you relax them? Explain, using graph(s) or equation(s).

c) How would your answer to (b) change if you thought firms’ decisions not only recognized their own “market power” but also the potential responses of their competitors (in an oligopolistic marketplace), compared to ignoring those responses? How would it affect (in general terms) your graphical and/or analytical framework? (if you already did this in (b) identify this “piece” and explain why it is important)

d) If you were applying this framework to ask whether a milk processing company was acting as an oligopolist (or monopolist), what kinds of measures would you want to derive from this framework to estimate? How would they be interpreted and are there any conceptual problems using them to represent market power?

e) What equation or equations would this suggest you would actually estimate if you wished to econometrically estimate the degree of market power?

f) Would your answers to the above change if you believed retailers also had market power with respect to their purchases of milk from processors? For example, what if the milk processor was selling to Walmart? Explain in words, and suggest how this might affect either the supply/demand graph(s) or equation(s) you used above for the processor, or those for the retailer.
2. It has been claimed for various food processing industries that they act in a monopsonistic (or oligopsonistic) manner. That is, they have consolidated sufficiently that they have market power relative to the farmers (producers) that produce the agricultural commodity they use as an input.

In particular, for the milk processing companies focused on in the last question, the producers would be dairy farmers. Raw milk produced by dairy farmers is an input into the production of fluid milk by milk processors. If there are many dairy farmers (ignore the existence of cooperatives for the moment), and few milk processors, the processors could potentially exploit monopsony/oligopsony power.

Say you wanted to evaluate the demand for raw milk by the milk processor(s) and the possibility that there is monopsony power. This question will ask you to consider the use of a cost function for such analysis and whether/how it would have to be adapted to do so.

a) First, explain and diagram (or write a model in equation form) a marketplace with monopsony/oligopsony power, and how that would affect the price and/or quantity of raw milk sold relative to a perfectly competitive input market.

b) Now consider the use of a cost function to evaluate input choice in such a scenario – in this case the demand for raw milk by milk processors.

   First explain the assumptions and optimization problem (no need to write the first order conditions) you would need to use a cost function to represent raw milk demand for a milk processing firm (along with demand for other inputs like labor, L, and capital, K).

   Then write the resulting cost function in general form – that is, what would be the arguments of the function? Explain in words.

c) What are the regularity conditions for this function? And how do the monotonicity requirements relate to input demands? (Shephard’s lemma)

d) What assumptions and/or regularity conditions in this cost function framework would need to be adapted to analyze the input demand choices of the milk processor if he is a monopsonist in purchasing raw milk? How might you build that into the optimization problem, and how would it affect the construction of a cost function?

e) What would the arguments of such a cost function be, and could you use Shephard’s lemma to get the input demand function for raw milk? Why or why not?

f) What if cooperatives increased the market power of the producers? For example, what if there was one coop representing all milk producers, and one milk processor purchasing the milk. Would that affect your analysis? Explain in words, with some support either from either a graph(s) or equation(s).
SECTION II: Choose either question #3 OR question #4 to answer

3. (a) Given a standard LP problem, where \( v \) is a \( n \times 1 \) vector of gross revenues per acre, \( c \) is an \( n \times 1 \) vector of average variable costs per acre, \( x \) is a \( n \times 1 \) vector of activity levels in acres, \( A \) is an \( m \times n \) matrix of Leontief production coefficients, \( b \) is a \( m \times 1 \) vector of input resources available. In the set of resource constraints assume \( k \) (\( k < m \)) are binding.

\[
\text{Max}_x \quad v'x - c'x \\
\text{Subject to} \quad Ax \leq b \\
\quad \quad \quad \quad x \geq 0
\]

a. Formally show, using linear algebra, the number of feasible solutions to this solution.

b. Now formally show the basic feasible solutions.

c. Explain briefly, but formally the first step of how an LP solution method would search for an improved solution from the set of basic feasible solutions.

(b) Now add a set of calibration constraints to the LP model defining it as:

\[
\text{Max}_x \quad v'x - c'x \\
\text{Subject to} \quad Ax \leq b \\
\quad \quad \quad \quad /x \leq \bar{x} + \varepsilon \\
\quad \quad \quad \quad x \geq 0
\]

Where \( \bar{x} \) is a \( n \times 1 \) vector of observed activity levels, and \( \varepsilon \) is a corresponding vector of small perturbation variables.

(i) Analytically show how the constrained model can be used to implement a PMP calibrated model. State any formulas needed.

(ii) Show that the PMP solution will optimize at the observed cropping levels without using additional information on the marginal activity.
(c) If you knew the elasticity of supply of the marginal crop, show how you could use this information in the calibration of the model.

(d) Compare and explain the properties of the two models calibrated by the two methods in parts (b) and (c). Will the dual values for the binding constraint be the same for the models in part (b) and part (c)? Explain briefly.

(e) If the LP and PMP models in parts (a) and (b) are used to generate points on a supply function by changing the price of the marginal crop. Describe analytically the difference in the resulting supply function between the LP and PMP model.
4. The following Gams program models California water trades. The demands and supplies are in standard quantity dependent form.

*REGION1=NORTH AG, REGION2 =SOUTH AG, REGION3=SAN FRAN, REGION4=LA.

SETS I DEMAND REGIONS  /D1,D2,D3,D4/
        J SUPPLY REGIONS  /S1,S2,S3,S4/

PARAMETERS A(I) DEMAND INTERCEPTS
       /D1 29.505, D2 32.06, D3 1.717, D4 4.612/

PARAMETERS B(I) DEMAND SLOPES
       / -0.751, D -0.683, D3 -0.002, D -0.0099/

PARAMETERS E(J) SUPPLY INTERCEPTS
       /S1 3.33, S2 -4.63, S3 -0.078, S4 -1.243/

PARAMETERS F(J) SUPPLY SLOPES
       /S1 1.258, S2 1.438, S3 0.0096, S4 0.024/

TABLE C(J,I) COSTS OF TRANSPORT BETWEEN REGIONS

<table>
<thead>
<tr>
<th></th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>0</td>
<td>16</td>
<td>33</td>
<td>120</td>
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<td>S2</td>
<td>50</td>
<td>0</td>
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<td>70</td>
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<tr>
<td>S3</td>
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<td>153</td>
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<tr>
<td>S4</td>
<td>140</td>
<td>90</td>
<td>160</td>
<td>0</td>
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</table>
VARIABLES
D(I) DEMAND PRICE
S(J) SUPPLY PRICE
OBJ OBJECTIVE FUNCTION;

EQUATIONS
SUR OBJECTIVE FUNCTION
TRADE(J,I) DIFFERENTIALS BETWEEN REGIONS;

SUR..SUM(I,(A(I)+ 0.5* B(I)*D(I)))*D(I))
   - SUM(J,(E(J)+ 0.5* F(J)*S(J))*S(J)) =E=
TRADE(J,I).. D(I) - S(J) -C(J,I) =L= 0.0;

MODEL INTERREG /ALL/;
SOLVE INTERREG USING NLP MAXIMIZING OBJ;

---- EQU TRADE DIFFERENTIALS BETWEEN REGIONS

<table>
<thead>
<tr>
<th>LOWER LEVEL</th>
<th>UPPER MARGINA</th>
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<tr>
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<td>S     -INF</td>
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<td>S     -INF</td>
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<tr>
<td>S     -INF</td>
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<td>S     -INF</td>
<td>-33.000</td>
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<td>S     -INF</td>
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S     -INF . .
S     -INF  41.989  153.000
S     -INF -74.989  140.000
S     -INF -70.000  90.000
S     -INF -41.989  160.000
S4.D  -INF . .

---- VAR D        DEMAND PRICE
                LOWER  LEVEL  UPPER  MARGINA
D1     .    13.653 +INF
D2     .    18.642 +INF
D3     .    46.653 +INF
D4     .    88.642 +INF

---- VAR S        SUPPLY PRICE
                LOWER  LEVEL  UPPER  MARGINA
S1     .    13.653 +INF
S2     .    18.642 +INF
S3     .    46.653 +INF
S4     .    88.642 +INF

                LOWER  LEVEL  UPPER  MARGINA
---- VAR -INF   942.484 +INF
(a) Show using algebra that for a given region "i" where the equilibrium price is $D(i)$, first term in the objective function maximizes the consumer surplus.

(b) (i) State relevant the Kuhn Tucker (KT) optimality conditions for this problem in general matrix form.

   (iii) Use the empirical output above to demonstrate by a single example whether the KT optimality conditions do or do not hold for the problem solution above.

(c) Use the above results to show that region 4 (LA) is in economic trade equilibrium with both regions 1 and 2.

(d) If the Department of Water Resources lowered the transport cost of water from Northern Agricultural regions (1) to Southern Agricultural regions (2) from $16 - $6, explain precisely how the optimal trade in water would change.

(e) The above derived demand for Los Angeles (region 4) has an elasticity of -0.59, at a price of $172.7 / acre-ft and quantity demanded of 2.9 Million Acre-ft. Recalculate the demand for an elasticity of -0.89 at the same price and quantity. Comment briefly on the likely impact on the optimal trade solution.
Section III. You MUST answer the following question:

5. Understanding spatial market integration in a region helps to reveal how markets function and often has direct policy relevance.

a. Describe the importance and policy relevancy of spatial market integration as it relates to famines in Africa. Be specific and concise.

b. Explain carefully why the correlation of prices in spatially-distinct markets is a deficient measure of market integration.

c. Define algebraically the three regimes that are possible in a spatial market equilibrium for trade from market 1 to market 0 \( (q_{10}) \) in the presence of a trade quota \( Q_{10} \). As notation, use \( p^i \) and \( q^i (i=0,1) \) as prices and quantities, respectively, and \( r_{10} \) as transaction costs for trade from 1 to 0.

d. Ravallion (1986) assumes the following price determination process for prices in hinterland markets: 
\[
P_{it} = \sum_{j=1}^{n} a_{ij} P_{it-j}^j + \sum_{j=0}^{n} b_{ij} P_{1t-j}^{1j} + \sum_{s=1}^{m} c_{si} X_{sit} + e_{it}, \]
where \( P \)'s are prices; \( X \)'s are control variables; \( a, b, \) and \( c \) are coefficients; \( e \) is a stochastic error term; and \( i \) indexes hinterland market \( i \) and 1 represents the central market.

(i) What restrictions on these coefficients are implied by total market segmentation (i.e., non-integration) of the central market and hinterland market \( i \)?

(ii) One testable hypothesis is that price changes in the central market are immediately transmitted to market \( i \) and that there are no lagged price transmission effects either from the central market or from market \( i \) itself. What restrictions on coefficients would you impose to test this hypothesis?

(iii) Another testable hypothesis is that price changes in the central market are immediately transmitted to market \( i \) and (in contrast to (ii)) that any lagged price effects vanish on average. What restrictions on coefficients would you impose to test this hypothesis?

(iv) At a long-run equilibrium, market prices are constant over time – i.e., \( P_{it}=P^*_i, P_{1t}=P^*_1, \) and \( e_{it}=0 \). A final testable hypothesis is that the central market is integrated with hinterland market \( i \) only at such a long run equilibrium. What restrictions on coefficients would you impose to test this hypothesis?

e. In the specification above, should prices for some periods be dropped in order to reduce multicollinearity problems? Describe the econometric tradeoffs involved as you address this question.
 Ravallion (1986) uses this specification to test spatial market integration of rice markets in Bangladesh, where Dhaka is the central market. F-test statistics for the linear restrictions implied by (i)-(iv) above and for three hinterland rice markets are shown below.

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Mymensingh</th>
<th>Rangpur</th>
<th>Sylhet</th>
</tr>
</thead>
<tbody>
<tr>
<td>d.(i)</td>
<td>18</td>
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<td>16</td>
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<tr>
<td>d.(ii)</td>
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<td>d.(iii)</td>
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</tbody>
</table>

For a critical F-value of 10, write a brief paragraph that describes these results in policy relevant terms.

g. Discuss carefully two critical limitations of tests of spatial market integration based on this specification. For each limitation, discuss potential remedies and their empirical costs and benefits.
You have four hours for this exam after a 20 minute reading period (8:30-12:50). You do not need to use the whole time period. Answer all three questions. Watch the time carefully. The logic used to answer the question is important, so be sure to clearly specify your reasoning, with full sentences. Supporting your answer, usually by diagrams or equations, is also important. Make sure your writing is legible; if we can’t read it, it will be assumed wrong.

1. Understanding spatial market integration in a region helps to reveal how markets function and often has direct policy relevance.

a. During a field visit, you learn that farmers are not applying fertilizer even though rainfall has been exceptionally good. In the hopes of convincing them to start using fertilizer, you explain that the marginal product of fertilizer is especially high because rainfall—a complementary input—has been so good. To this, the farmers respond: “We know that, but all this rainfall also means that crop prices will be especially low at harvest. Since prices will fall, investing in fertilizer just doesn’t make sense.”

   (i) Carefully discuss what role spatial market integration plays in this setting.
   (ii) Given the farmers’ statement, describe the policy relevancy of spatial market integration. Be as specific as possible.

b. Suppose that the only barrier to trade between two markets is the transaction costs associated with moving goods between the two markets (i.e., there are no quotas or bans on trade). Define algebraically the two regimes that are possible in a spatial market equilibrium for trade from market 1 to market 0 ($q_1^0$). As notation, use $p_i$ and $q_i$ ($i=0,1$) as prices and quantities, respectively, and $t_{10}$ as transaction costs for trade from 1 to 0.

c. Ravallion (1986) assumes the following price determination process for prices in hinterland markets: $P_{it} = \sum_{j=1}^{n} \alpha_{ij} P_{ij} + \sum_{j=0}^{m} \beta_{ij} P_{i-1,j} + \sum_{s=1}^{m} \gamma_{is} X_{is} + \theta_{it} + \epsilon_{it}$, where $P$’s are prices; $X$’s are control variables; $a$, $b$, and $c$ are coefficients; $\theta$ is a stochastic error term; and $i$ indexes hinterland market $i$ and 1 represents the central market.

   (i) Sketch the structure of this market using arrows to indicate price transmission and assuming there are five hinterland markets.
   (ii) “The central market and hinterland market $i$ are totally unintegrated.” What restrictions on the coefficients are implied by this statement?
   (iii) One testable hypothesis is that price changes in the central market are immediately transmitted to market $i$ and that there are no lagged price
transmission effects either from the central market or from market $i$ itself. What restrictions on coefficients would you impose to test this hypothesis?

(iv) At a long-run equilibrium, market prices are constant over time – i.e., $P_{it}=P^*_i$, $P_{1t}=P^*_1$, and $e_{it}=0$. A final testable hypothesis is that the central market is integrated with hinterland market $i$ only at such a long run equilibrium (i.e., when the relationships above hold). What restrictions on coefficients would you impose to test this hypothesis?

d. Ravallion (1986) uses this specification to test spatial market integration of rice markets in Bangladesh, where Dhaka is the central market. F-test statistics for the linear restrictions implied by (i)-(iv) above and for three hinterland rice markets are shown below.

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Mymensingh</th>
<th>Rangpur</th>
<th>Sylhet</th>
</tr>
</thead>
<tbody>
<tr>
<td>d.(i)</td>
<td>18</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>d.(ii)</td>
<td>60</td>
<td>236</td>
<td>15</td>
</tr>
<tr>
<td>d.(iii)</td>
<td>7.1</td>
<td>99</td>
<td>6</td>
</tr>
<tr>
<td>d.(iv)</td>
<td>5.4</td>
<td>184</td>
<td>9.1</td>
</tr>
</tbody>
</table>

For a critical F-value of 10, write a brief paragraph that describes these results in policy relevant terms.

e. Carefully discuss the role restrictions play in applied economics research, including how they are used and why.
2. (25 points) Use the Gams printout below to answer the questions

```
SET I CROPS /CORN (CORN), RICE (RICE), BEAN (DRY BEANS),
       ALMD (ALMONDS), TOMA (TOMATOES) /
J RESOURCE SET /LAND, WATER, LABOR, OTHER /

*****************************************************************
PARAMETER MR(I) MARGINAL REVENUE PER ACRE
/CORN 1124.325, RICE 644.770, BEAN 442.350, ALMD 1564.920
       TOMA 1659.209/
PARAMETER R(J) RESOURCE CONSTRAINT
/LAND 337.280, WATER 1439.700, LABOR 4800.00, OTHER 2900.800/

TABLE A(J,I) LEONTIEFF COEFFICIENT
             CORN  RICE  BEAN  ALMD  TOMA
LAND     1.000  1.000  1.000  1.000  1.000
WATER     4.079  2.619  3.529  2.991
LABOR    12.694 12.698  6.351 25.381 25.401
OTHER     8.598  8.602  8.601  8.601  8.5

PARAMETER CL(I) AVERAGE COST PER ACRE
/CORN 398.379, RICE 479.126, BEAN 262.962, ALMD 655.110 TOMA 595.333/
PARAMETER XB(I) BASE LAND ALLOCATION
/CORN 79.410, RICE 147.270, BEAN 32.800, ALMD 44.600 TOMA 33.200/

58 * LINEAR CALIBRATION PROGRAM
59 ***************************************************************
60 VARIABLES LX(I) ACRES PLANTED
61 LINPROF LP PROFIT

63 POSITIVE VARIABLE LX;
64 EQUATIONS RESOURCE(J) CONSTRAINED RESOURCES
65 CALIB(I) CALIBRATION CONSTRAINTS
66 LPROFIT LP OBJECTIVE FUNCTION;

68 RESOURCE(J SUM(I, A(J,I)*LX(I)) =L= R(J
70 CALIB(I)$XB(I).. LX(I ) =L= XB(I ) *1.001
72 LPROFIT.. SUM((I), (MR(I) -CL(I))*LX(I)) =E= LINPROF;

74 MODEL CALIBRATE / ALL /;
76 SOLVE CALIBRATE USING LP MAXIMIZING LINPROF;
----- EQU RESOURCE CONSTRAINED RESOURCES

LOWER LEVEL UPPER MARGINA
   -INF  337.280  337.280   16
WATER  -INF  1439.348 1439.700
L   -INF  5062.463  5100.000
O   -INF  2900.787  2900.800
----- EQU CALIB CALIBRATION CONSTRAINTS
```

---
Use the calibrated results to calculate the Basic PMP parameters $\alpha$ and $\gamma$ for corn and beans.

Show that your basic PMP parameters will result in the PMP model calibrating corn and beans at the required XB acres shown in the data above. Explain what economic principle this illustrates.

Calculate the supply elasticity for corn implied by the PMP coefficients. Remember that given constant yields, supply elasticity becomes:

$$\eta_s = \frac{\partial x_j}{\partial m_{ij}} \frac{m_{ij}}{x_j}$$

State and briefly discuss one criticism of the Basic PMP model.

If you are given the true elasticity values are 0.55 for Corn, use this value to show how you can calculate the Elasticity based PMP parameter values ($\alpha$ and $\gamma$ values) for Corn.

Assume you have an Elasticity based PMP model for all crops. Explain briefly how the model will respond when the right hand side on land is parameterized downward.
3. Consider a monopolist who serves two separated markets with demands as follows:

\[
Q_1 = 55 - P_1 \\
Q_2 = 70 - 2P_2
\]

The monopolist's production costs are \( c(Q_1, Q_2) = 5(Q_1 + Q_2) \).

This question is designed to be answered using relatively simple calculus and algebra. You can substitute carefully drawn graphs for this math for most parts of this question if you get stuck on the math.

a. Set up the monopolist's profit maximization problem and solve for its profit-maximizing price and output in each market. Confirm that at the optimum demand is more inelastic in the high-price market.

b. Compute consumer surplus, monopoly profit, and deadweight loss in these markets based upon your results in part (a). (Illustrate these measures graphically if you did not get a quantitative answer to part (a)).

c. Suppose the monopolist is allowed to discriminate as in part (a), but consumers are able to resell the product between the markets by incurring a cost of 3 for each unit of product shipped between markets. What will be price and output in each market given this possibility of customer arbitrage?

d. Suppose market 1 consists of 10 consumers, each with identical demands, and market 2 consists of 20 consumers, each with identical demands. Furthermore, suppose the monopolist can monitor consumption and prevent consumers from transferring the product among themselves. Consider implementing a two-part tariff scheme in each market. What access or entry fee and what per-unit price should the monopolist charge in each market to maximize profits?

e. Does the monopolist make more profit under the solution in part (a) or the solution in part (d)? Explain why. (Obviously you can give a quantitative answer to this question based upon your results in the two parts. I am most interested in an economic explanation, which you can provide, even if you lack a quantitative answer to (a) and/or (d).)

e. Assume the identical problem set up as in part (a), but now the two products are produced by a large number of competitive producers. Will the industry still be able to practice price discrimination under this market structure? Explain why or why not. What will the market price be assuming that the competitive firms have the same costs as the monopolist had?
You have four hours for this exam after a 20 minute reading period (8:30-12:50). You do not need to use the whole time period. This exam consists of five questions.

- You must answer questions 1 and 2. Each is worth 30% of the total exam score.
- Choose two questions to answer among questions 3, 4 and 5. Do not answer all three. Each of these two questions is worth 20% of your exam score.

Watch the time carefully. The logic used to answer the question is important, so be sure to clearly specify your reasoning, with full sentences. Supporting your answer as rigorously as possible – usually by diagrams or equations – is also important. This is not the time to economize on paper. Make any graphs you draw large and easily read. Make sure your writing is legible; if we can’t read it, it will be assumed wrong.
You must answer the following question. It is 30% of your exam score.

1. Some of the most influential applied economists have spent their careers estimating production functions and refining these empirical methods in order to characterize production relationships more accurately.

a. Briefly why understanding agricultural production functions has direct policy relevance. Use a specific example to demonstrate the practical merits of applied production analysis. In your example, discuss two specific policies that might be improved by careful econometric work to estimate production relationships.

b. While agricultural production is inherently shaped by geography, the relationship between agricultural productivity and isolation (i.e., distance to larger cities or towns) tends to be stronger in poor countries than in rich countries:

(i) Use your understanding of production economics to identify three specific factors (labeled #1, #2, #3) that explain how isolation might affect agricultural productivity in developing countries. Carefully discuss each factor and how it may relate to productivity.

(ii) When framing a research question, it is often insightful to represent the relationships of interest in a theoretical model. What kind of theoretical model could encompass the factors you identified in (i)? Describe a specific modeling feature (i.e., set of assumptions) you could use to explore how each of your three factors potentially links isolation and agricultural productivity (refer to #1, #2, #3).

c. Consider how you might empirically test the relationship between isolation and productivity:

(i) Devise an econometric specification that would allow you to test whether and how isolation affects agricultural productivity. Define the variables in your specification and discuss the hypotheses of interest.

(ii) What kind of data would you need to estimate this econometric model?
Question 1 continued.

d. A recent analysis in Madagascar used rice yield (kg/acre) at the plot-level as the dependent variable to estimate the following reduced-form determinates of yield:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std.Dev</th>
<th>Coef.</th>
<th>Std.Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of transporting 50kg of rice to nearest urban market (log)</td>
<td>8.78</td>
<td>1.25</td>
<td>-0.17</td>
<td>0.017</td>
</tr>
<tr>
<td>Distance from plot to passable route (minutes walking)</td>
<td>20.1</td>
<td>22.65</td>
<td>-0.005</td>
<td>0.00075</td>
</tr>
</tbody>
</table>

Constant | 4.39 | 0.15   |
Adjusted R² | 0.08 |       |
N= | 1,939 | |

(i) If these results were part of a paper you were writing, how would you interpret and discuss these results? Write a single paragraph that discusses these results, including their economic / statistical significance and potential limitations.

(ii) Both measures of isolation in the model above depend on the placement of roads based on decades of decisions about where to build roads. What econometric problems might arise from how these road construction decisions were made? Be as specific as possible.

(iii) What could you do to remedy this econometric problem(s)? Again, be specific.

e. The reduced-form model above takes a primal production approach:

(i) What about the model makes it a primal approach?

(ii) What are the main limitations with a primal approach?

(iii) Suppose you wanted to take a dual approach to this same research question. Write out an econometric specification that would allow you to test the relationship between isolation and agricultural productivity using a dual approach. Define variables as needed and discuss the key hypothesis tests.
You must answer the following question. It is 30% of your exam score.

2. Consider \( X = (X_1, \ldots, X_N) \) a vector of consumption goods, and \( P = (P_1, \ldots, P_N) \) a vector of the market prices for those goods. *Utility function*, *consumer demand function*, *market demand function*, and *indirect utility functions* are concepts from consumer theory.

   a. Write general functional specifications for each of these four functions (i.e., do not pick a specific functional form) using the variables and notation given to you in the problem and introducing whatever new variables and notation you need.

   b. Using your knowledge of microeconomic theory, explain the conceptual relationships among these four functions. Next, provide the mathematical relationships between these functions. While no formal derivations are required, your conceptual and mathematical description should clearly demonstrate how one can move between these functions.

   c. Now let us use some of these concepts to think about an applied problem. The Leafy Greens Marketing Agreement (LGMA) was formed in 2007. “Leafy greens” refers essentially to different types of leaf lettuce, spinach, and chard. The following is copied from the LGMA website:

   Over 100 handlers [shippers], representing approximately 99% of the volume of California leafy greens, are LGMA members. (Most shippers are also vertically integrated growers.) These companies have committed themselves to sell products grown in compliance with the food safety practices accepted by the LGMA board. LGMA membership requires verification of compliance with the accepted food safety practices through mandatory government audits. These food safety practices were developed by university and industry scientists, food safety experts and farmers, shippers and processors. California leafy greens are now grown under a unique system that has become a model for leafy green growers in other states.

   LGMA is an example of a marketing order, which enables agricultural industries to voluntarily self regulate. However, once the decision is made to create an order such as LGMA, compliance with its provisions becomes mandatory. Let us take as given that complying with the safety practices and audits will cost handlers/shippers money.

   Why did the shippers voluntarily implement this regulation? Sketch a model that begins with consumer utility to explore the impacts of this regulation on the demand side of the market using the concepts from part (a) (you may well not want/need to use them all).

   d. Indicate one testable hypothesis from your theoretical model and describe briefly the econometric specification and data you could use to test that hypothesis.
Answer two of the following three questions. Each of these questions is worth 20% of your total exam score. Under NO circumstances should you answer all three questions.

3. Offshoring (i.e., offshore outsourcing) is a practice where a domestic firm outsources services in a foreign country, primarily to take advantage of lower labor costs. For instance, U.S. high-tech firms may employ software engineers in India, and U.S. airlines often use offshore workers to help you by telephone to rebook that missed flight.

A well-known U.S. economist Gregory Mankiw believes that offshoring is good for the U.S. He wrote, “Offshoring is just a new way of doing international trade. More things are tradable than were tradable in the past, and that’s a good thing.”

Alternatively, Paul Samuelson, another pretty good economist, is quoted as saying that there is no “necessary surplus of winnings over losings” due to offshoring.

U.S. politicians have argued that offshoring affects American workers by “undermining their primary competitive advantage over foreign workers: their physical presence in the U.S.”

a. Why does Mankiw say that offshoring is a good thing?

b. Who is it good for in the United States?

c. Are there overall gains to the United States? To answer this question, assume there are only two goods in the economy and that one of these goods is nontradable before offshoring and both goods are tradable after offshoring (you may choose to use a production possibility frontier diagram to answer this question).

d. Explain why Samuelson may be correct. Please be explicit as to what assumptions may be required for Samuelson to be correct and use a diagram to answer this question.)
4. Until recently, several studies found that the production of corn ethanol reduced greenhouse gas (GHG) emissions as compared to gasoline but the difference was quite small (around 20%) because it takes almost a gallon of fossil fuel to produce a gallon of corn-based ethanol. Then in 2008 a paper published in *Science* concluded that after accounting for indirect land use changes, corn ethanol actually increased carbon emissions as compared to gasoline. This was a startling result. The basic argument in the *Science* paper was that if 1/3 of U.S. corn acreage is diverted to producing ethanol, global corn and soybean prices will increase and countries like Brazil will cut down rainforests and plow up grassland in order to produce more corn and soybeans. The opening up of new land in places like Brazil releases sequestered carbon and this makes corn-based ethanol production in the United States a bad idea from an environmental standpoint.

According to both U.S. and California law, corn-based ethanol only meets the standards for a renewable fuel if (after the appropriate adjustments) it reduces the GHG emission by 20% relative to gasoline. Otherwise it is not considered a renewable fuel and burning it in our vehicles does not help meet GHG reduction targets. This means that consideration of indirect land use effects of corn-based ethanol is critical to the future of the corn ethanol industry in the United States. The U.S. ethanol industry and some agricultural economists argue that “if a tree falls in the Amazon”, U.S. corn and ethanol ethanol producers should not be held responsible. An agricultural economist was recently quoted as saying “the inclusion of indirect land use calculations in the California and Federal regulations of biofuel should be discontinued.”

a. Explain how economists using the theory of externalities should view indirect land use in this context.

b. Do you agree or disagree with the view that biofuels regulation should not consider indirect land use effects of corn ethanol? Explain.

c. Discuss some of the problems that might be encountered by economists and scientists as they try to measure indirect land use effects in a foreign country.

d. The United States places a 54-cents-per-gallon import tariff on (sugar based) ethanol from Brazil. Explain (possibly with the use of a diagram) how this tariff affects the price of corn in the U.S. Is the ethanol tariff consistent with the view that ethanol is an environmentally friendly fuel?
5. “Spare the Air” (STA) is a program implemented in major cities to discourage car travel on days when ozone (smog) levels are expected to be particularly high. Because ozone levels depend upon weather conditions, the announcement of a STA day usually comes with relatively short notice, but the information is disseminated through normal media outlets. People are asked to avoid car trips and use mass transit as an alternative on STA days. In the Bay Area on some STA days free fares have been offered on buses and other forms of mass transit such as the subway system known as BART.

Let us use the Bay Area as our specific focus to analyze the impacts of STA days. Assume the following is true for purposes of answering this question:

- Most exposure from ozone is from being outdoors.
- Exposure to ozone on STA days may be harmful to at least some peoples’ health.
- Congestion on the roadways is a problem in the Bay Area, especially during rush hours.
- Congestion on mass transit may be a problem.
- People spend more time outdoors using mass transit for travel than using personal cars.

a. Discuss the impacts of a declaration of a day as STA on (i) car trips and (ii) mass transit trips on that day, and (iii) on human health. You need not set forth a formal model (i.e., you can rely upon your economic intuition), but your discussion should be rigorous and give consideration to the various factors that are at issue here.

b. Set up an econometric model to test the impacts of a STA declaration on car trips and discuss the data you would need to implement your model. An ideal answer here will involve specification of equations you would intend to estimate.
University of California, Davis  

Department of Agricultural and Resource Economics  

M.S. Comprehensive Exam, August 16, 2010  

You have four hours for this exam after a 20 minute reading period (8:30-12:50). You do not need to use the whole time period. This exam consists of three questions. You must answer each question; there is no choice on this exam. Question 1 is worth 40% of your grade, while questions 2 and 3 are each worth 30%.

*Watch the time* carefully. The logic used to answer the question is important, so be sure to clearly specify your reasoning, with full sentences. Supporting your answer as rigorously as possible – usually by diagrams or equations – is also important. This is not the time to economize on paper. Make any graphs you draw large and easily read. Make sure your writing is legible; if we can’t read it, it will be assumed wrong.
You must answer the following question. It is 40% of your exam score.

1. Some of the most influential applied economists have spent their careers estimating production functions and refining these empirical methods in order to characterize production relationships more accurately.

a. Explain how understanding agricultural production functions can improve policy. Carefully describe three specific policies that could be improved by econometric work to estimate production relationships.

b. While agricultural production is inherently shaped by geography, agricultural productivity tends to decline faster with isolation (i.e., distance to larger cities or towns) in poor countries than in rich countries.
   (i) Explain briefly why this relationship is stronger in poor countries than in rich countries.
   (ii) Substantial empirical evidence suggests that agricultural productivity is inversely related to farm size. How might this help to explain the negative productivity-isolation relationship?
   (iii) Set up a theoretical optimization model that could ultimately provide comparative statics to explore the productivity-isolation relationship in poor countries. Clearly specify the objective function, choice variables, and constraints. After specifying the model, discuss what feature of the model might introduce a relationship between productivity and isolation.

c. A recent analysis in Madagascar used rice yield (kg/acre) at the plot-level as the dependent variable to estimate the following reduced-form determinants of yield:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std.Dev</th>
<th>Econometric Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of transporting 50kg of rice to nearest urban market (log)</td>
<td>8.78</td>
<td>1.25</td>
<td>-0.17</td>
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<tr>
<td>Constant</td>
<td></td>
<td></td>
<td>4.39</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td></td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>N=</td>
<td></td>
<td></td>
<td>1,939</td>
</tr>
</tbody>
</table>

(i) Both measures of isolation in the model above depend on the placement of roads based on decades of decisions about where to build roads. What econometric
problems might arise from how these road construction decisions were made? Be specific.

(ii) How do you think these econometric problems may affect these results? Be specific.

(iii) What could you do to remedy this econometric problem(s)? Be specific.

d. The reduced-form model above takes a primal production approach:

(i) What about the model makes it a primal approach?

(ii) What are the main limitations with a primal approach?

(iii) Suppose you wanted to take a dual approach to this same research question. Write out an econometric specification that would allow you to test the relationship between isolation and agricultural productivity using a dual approach. Define variables as needed and discuss the key hypothesis tests.
You must answer the following question. It is 30% of your exam score.

2. Consider an importing country applying either an import tariff $t$ or an import quota $m$ to imports of a homogenous good.

   a. Begin by assuming a “small” importing country and with a Supply and Demand diagram show the home and world market (in two separate panels). Draw the free trade price and import volume. Then explain the effects of the “small” country import tariff on the volume of trade, world price, home price, home supply and demand. In your diagram show the effects of the tariff on home consumer surplus, producer surplus, government revenue and the overall net welfare effect on the home country.

   b. Now assume a “large” importing country and using a similar diagram as in part a) above, demonstrate the impacts of the tariff on prices, volumes supplied, consumed and traded. Indicate the net welfare effects in the home country with the use of producer surplus, consumer surplus and government revenue. How does the impact of an import tariff for a “large” country differ from the case in part a) for a “small” country.

   c. Using the framework in part b) draw a new set of panels (home and world market) and show the optimal import tariff and the associated welfare impacts. Provide an intuitive explanation of the welfare gains and losses associated with the optimal tariff.

   d. Return to the “small” country assumption and using the same graphical framework as in part a), show the price, volume and welfare effects associated with an import quota. Set the quota at a level that gives the same volume of imports as under the tariff in part a). How do the welfare effects associated with the import quota differ from those under an import tariff for the small country? Please be explicit as to your assumption regarding the distribution of the quota rents.
You must answer the following question. It is 30% of your exam score.

3. Two of the most common policy tools to support the incomes of farmers are (i) price floors and (ii) deficiency payments. Price floors work by literally establishing a minimum price for the commodity, with the government committing to purchase any product not sold into the open market at the floor price. Deficiency payments also set a minimum support price, but the market is allowed to clear (i.e., the government does not purchase any commodity under a deficiency payment program). The government provides a deficiency payment to farmers on each unit of production in an amount equal to the guaranteed support price minus the actual market price.

a. Consider a prototype perfectly competitive agricultural product market and analyze the impacts of a price floor program and a deficiency payment program on the market. Use graphs (one for each program) to conduct your analysis. Assume the minimum price binds in each case in the sense that it is above the unregulated market price. Show the following on your graphs: (i) quantities produced and consumed, (ii) deadweight loss, and (iii) the amount of government expenditure for each program.

b. Suppose the goal of government in choosing between a price-floor and deficiency-payment program is to minimize the amount of the government’s expenditure subject to transferring a given amount of income to farmers in the market. Explain how the price elasticities of supply and demand for the commodity will help determine which program the government chooses under this criterion. (Hint: Try illustrating the two programs for markets with elastic demands and supplies and inelastic demands and supplies.)

c. Many agricultural economists are concerned about monopsony (buyer) market power in agricultural markets because often farmers have only one or a few buyers for their products. Suppose for simplicity that our market has a single buyer—it is a pure monopsony. Repeat your analysis in part (a) but now for the case of a monopsony buyer. First show the monopsony equilibrium. Then analyze the impacts of a price floor and a deficiency payment (use two graphs), with the minimum price set above the monopsony equilibrium price. As in part (a), depict (i) quantities produced and consumed, (ii) deadweight loss, and (iii) the amount of government expenditure for each program.

d. Many agricultural economists argue that government support of farmers should be decoupled from the market. By decoupling they mean that the government should find ways to transfer income to farmers (such as direct cash payments) that do not interfere with the workings of the market. In other words, price-floor and deficiency-payment programs should be eliminated and replaced with direct cash payments. Use your analysis in parts (a) and (c) to evaluate the economic logic of this argument. Is decoupling likely to improve economic welfare in a perfectly competitive agricultural market? Why or why not? Does your conclusion for perfect competition necessarily hold for monopsony? Explain.