WRITTEN PRELIMINARY Ph.D EXAMINATION

Department of Applied Economics
June/July - 2006
Trade, Development and Growth

For students electing

Macro (8701) & New Trade Theory (8702) 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. Analysis of trade reform and economic growth

Many countries that are net importers of food protect their agricultural sector by tariffs. The reasons for protection often include

1. Food security,

2. The rational that world prices would be higher if advanced countries did not protect their agriculture, thus causing surplus world production which places downward pressures on world agricultural prices and hence an implicit tax on a food importing country’s farmers,

3. Most of a country’s poor reside in the rural sector, and they tend to be net producers of agricultural goods. Protection of agriculture is a way to transfer income to the poor.

Consider an economy with the following basic features at some point in time, say $t = 0$.

<table>
<thead>
<tr>
<th>Table 1: Main features of the economy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>K share</td>
</tr>
<tr>
<td>L share</td>
</tr>
<tr>
<td>Land share</td>
</tr>
<tr>
<td>Output share</td>
</tr>
<tr>
<td>Cons. share</td>
</tr>
<tr>
<td>Trade</td>
</tr>
<tr>
<td>Tariff rate</td>
</tr>
<tr>
<td>$K(0) &lt; K_{ss}$</td>
</tr>
<tr>
<td>Pop. gwth rate = 0.024</td>
</tr>
<tr>
<td>Harrod $x = 0.014$</td>
</tr>
</tbody>
</table>

Suppose that you have analyzed the effect on the economy from removing the 25 percent level of protection on agriculture by using an inter-temporal three sector growth model. Some of the results appear in the accompanying charts and table.
Table 2: Selected "steady" state values in year $t = 100$

<table>
<thead>
<tr>
<th></th>
<th>tariff = 0.25</th>
<th>tariff = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$K_{ss}(t = 100)$ (bils.)</td>
<td>16399</td>
<td>16925</td>
</tr>
<tr>
<td>$P_{ss}$</td>
<td>1.0331</td>
<td>1.0331</td>
</tr>
<tr>
<td>$w_{ss}(t = 100)/$worker/yr</td>
<td>9364</td>
<td>9364</td>
</tr>
<tr>
<td>$GDP_{ss}/$worker ($t = 100)$ (bils.)</td>
<td>16628</td>
<td>16862</td>
</tr>
<tr>
<td>Land rent (profits) (bils.)</td>
<td>9.79428</td>
<td>0.9421</td>
</tr>
<tr>
<td>Equivalent variation</td>
<td>1856</td>
<td>3</td>
</tr>
</tbody>
</table>

Steady state is in ""·"" because some of the variables grow at rate $x$ per worker forever.

Equivalent variation is the amount the agent would be willing to pay in period $t = 0$ to obtain the discounted present value of utility associated with the NO tariff economy.

![Level of ag imports with and without protection](image)
1. Explain the effects of trade reform on the economy. More specifically, why did the removal of the tariff cause:

(a) Labor to depart agriculture?
(b) The price of home goods to decrease in transition
(c) The output of manufacturing and service to increase? And,
(d) What has been the major "source" of households willingness to pay about 19 percent of their wage income in period $t = 0$ to remove the protection on agriculture?

2. Notice that the simulation of trade reform causes an instantaneous adjustment in $t = 0$ between the tariff and non-tariff regime.

(a) How would you describe, qualify or explain this result to a policy maker? (short answer please)
(b) How would you "counter" a policy maker’s argument above about: (1) food security OR (2) world prices, OR (3) the rural poor (short answer on one of these)
(c) Does trade reform affect the country’s long-run rate of growth? (yes or no)
3. Acemoglu, (among many others) suggests that the quality of institutions is the only positive and significant determinant of income levels. Rodrik and Sachs among others argue that integration can induce trickle down institutional reform. Notice that the results of the simulation of trade reform above increases the share of GDP in foreign trade.

(a) How might you use the above model to obtain insights into the link between foreign trade reform (i.e., integration) and "trickle down" institutional reform? (Short answer please)

II. Stylized Facts on Trade and Multinationals

Use your knowledge of trade and multinational theory to explain of the five stylized facts below.

1. A large proportion of trade and direct investment occurs between relatively similar economies—similar in size and relative endowments.

2. A large proportion of trade and direct investment is two-way trade in similar products (i.e., intra-industry).

3. Direct investment has grown faster than trade in recent years.

4. A large proportion of direct investment is concentrated among developed countries. That is, direct investment tends to flow North-North rather than North-South or South-South.

5. A large proportion of direct investment is "horizontal" rather than "vertical."

6. Select ONE of the above 5 observations and "Sketch" how you would "model" the respective observation.
SET TWO:

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

III. New trade theory: direction & type of trade

The "new trade theory" has enriched our understanding of the causes and consequences of trade by adding elements of increasing returns to scale, imperfect competition, and product differentiation to the traditional comparative advantage models of trade. Recent research develops theory models where market structure is determined endogenously. Market structure refers to the choice of firm types—national enterprise (NE)- versus multinational enterprises (MNEs). In this context, demonstrate/discuss how the equilibrium market structure depends on:

1. Firm-level scale economies and plant-level scale economies
2. Tariffs and transportation costs
3. Similarity of country size and relative endowments

Be analytical in answering these questions.

IV. New trade theory: trade, investment & knowledge capital

Recent research develops theoretical models to analyze the liberalization of trade versus the liberalization of direct investment. Demonstrate/discuss the impact, on equilibrium market structure, of:

1. Liberalizing trade while maintaining a ban on investment
2. Liberalizing investment while maintaining a ban on trade
3. Liberalizing both trade and investment.
4. Recent research considers the distinction between horizontal and vertical multinationals within the hybrid "knowledge-capital model." According to theoretical predictions, what country characteristics explain horizontal multinationals versus vertical multinationals.

V. Analysis of food aid in static general equilibrium

Consider a static three-sector framework

The household
Given the micro-economic primitives

\[ u = \mu(q_m, q_a, q_s) \] utility

where

- \( q_m \) = industrial good consumption
- \( q_a \) = \( q^* + q^c_a \) = total food = food aid + commercial food purchases
- \( q_s \) = service good consumption

The individual budget constraint

\[ Y = p_m q_m + p_o q_a^c + pq^* + p_s q_s \]

where \( Y \) is income, and \( p \) is the "food stamp price" of food aid \( q^* \), can be expressed as

\[ Y + q^* (p_a - p) = p_m q_m + p_o q_a + p_s q_s \]

if a black market does not exist for \( q^* \).

Firms
Firms employ the CRS technologies

\[ y_j = f^j (\ell_j, k_j) \] production, \( j = m, s \)

\[ y_a = f^a (\ell_a, k_a, h) \] agriculture production

\[ wL + rK + \pi H = \text{factor payments to the total endowments of labor} \ L, \text{capital} \ K \text{ and land} \ H \text{ where} \ \pi = \text{land rental rate} \]
Economy
Thus, the economy’s total income is
$$wL + rK + \pi H + Q^* (p_a - p)$$
where total food aid $Q^* = \sum q^*$. 

Question
1. Characterize the equilibrium for this small open and competitive economy that exports the $m$ good and imports the $a$ good, while good $j = s$ is only traded in the domestic economy, and receives $Q^*$ in food aid.

2. The home good price equation:
   (a) Indicate the conditions from which you would derive this equation, and define its arguments (i.e., you need NOT derive it)
   (b) State (i.e., you need not prove) this equation’s key mathematical properties
   (c) Explain why you might expect $\partial p_s / \partial Q^* > 0$

3. Now, use a two-dimensional diagram to explain the effects of, say "large" amounts of $Q^*$ on this economy.

VI. Growth theory
Consider the environment of the three sector growth model. For consistency in notation, agents produce and consume three goods, indexed $j = m, s, a$, at each instant in time at price $p_j$. The services of labor, $L(t)$, and capital, $K(t)$, are employed in the production of all three goods while land, $H$, a sector specific factor, is also employed in the production of the agricultural good, $j = a$. The manufactured good, indexed $j = m$, is both a consumption and a capital good that is also internationally traded. The home good, indexed $j = s$, is a pure consumption good. Labor services are not traded internationally and domestic residents own the entire stock of domestic assets. Households earn income from providing labor services $L$ in exchange for wages $w$, earn interest income at rate $r$ on capital assets $A$, and receive rents from agriculture’s sector specific resource, land $T$. 

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Let the key primitives be the following. The manufacturing and home good sectors \((j = m, s)\) employ constant returns to scale technologies that, at the sector level, can be expressed as

\[
Y_j (t) = F^j (A(t) L_j (t), K_j (t)), \ j = m, s
\]  

(1)

where \(A(t) = e^{xt}\) is exogenous labor augmenting change.

Agriculture’s sector level technology is

\[
Y (t)_a = F^a (A(t) L_a (t), K_a (t), A_a (t) H)
\]

where land \(T\) is specific to the sector but can be rented at price \(\pi\) among firms within the sector. The technology \(F^a (\cdot)\) has the same properties as (1). Land’s productivity can also grow exogenously as determined by

\[
A_a (t) = e^{n t}
\]

Households are represented by the typical infinitely-lived Ramsey consumer that receives utility from the sequence \(\{C_m, C_a, C_s\}_{t=0}^{t=\infty}\) expressed as a weighted sum of all future flows of utility

\[
\int_{t=0}^{t=\infty} u(C_m, C_a, C_s) \frac{1-\theta}{1-\theta} e^{(n-\rho)t} dt
\]  

(2)

The number of household members are assumed to be proportional to the number of workers, to grow at the exogenously given positive rate \(n\),

\[
L (t) = e^{nt} L (0)
\]

and to discount future consumption at the rate \(\rho > 0\).

**Answer question (1) or (2) but not both.**

1. **Equilibrium:**

   (a) Characterize **both** the intra- and inter-temporal equilibrium for this model (you need not derive the necessary dual functions, such as cost and revenue, just state and use them)

   (b) Indicate how you solve for the model’s steady state level of capital
(c) Presume that you have derived the model’s two key differential
equations. Discuss the time elimination method used to empiri-
cally solve them.

2. The no-arbitrage condition:

(a) Show why the budget constraint

$$\dot{k} = w + rK + \pi H - E$$

implies a no-arbitrage condition between the capital asset $K$ and
the land asset $H$

(b) What are "some" implications of this condition?

(c) Aside from the above model, suppose that there is segmentation
between say urban capital markets and rural capital markets so
that for urban households, the following Euler condition applies

$$\frac{\dot{E}_{urban}}{E_{urban}} = r_{urban} - \rho$$

and for the rural households the Euler condition is

$$\frac{\dot{E}_{rural}}{E_{rural}} = r_{urban} - \rho$$

where, as is typical in developing countries, at some transition
point, $t$

$$r_{urban}(t) < r_{rural}(t)$$

i. What implications might this difference in the return to urban
vs rural capital assets imply about the market for land, and
the price of land?

ii. What implications might this difference imply about a policy
of "land reform" in which low income households are given
title to land?