Answer key: International Trade and Investment

Final exam fall 2013

17th December 2013

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Question 1:

Consider a capital abundant economy with three goods (1, 2, 3), all homogeneous and produced with constant returns to scale, and three internationally immobile factors of production (land, T, capital, K, and labour, L) with the factor prices *h*, *r* and *w* respectively. Let good 1 be land intensive, 2, capital intensive and good 3 labour intensive. The equilibrium is determined by the usual conditions of zero profit, full employment and market clarification.

a) Use the zero-profit condition (and Jone's algebra) in order to derive a generalisation of the Stolper-Samuelson theorem.
b) Discuss whether the generalisation is as strong as in the 2-by-2 case and explain by using a trade shock such as an increase of the price of good 1.
c) Assume that the economy is in a trade equilibrium and within the set of factor price equalisation. Give an account of the product mix and the specialisation pattern of this economy. Describe the underlying conditions supporting your answer.
d) Drop one factor of production (land) so that we face an uneven case with more goods than factors. How would your answer in c) change. Use a Lerner diagram in order to support your answer (explain the different parts of the diagram with words).

Answers:

a) Use ...

This follows the Jone's algebra in Feenstra pp. 13-15 and the discussion on pp. 69-71, and we take our point of departure in the zero-profit condition:

$$price = p_i = c_1(h, r, w) = \text{mc} = \text{unit cost}$$

$$dp_i = \frac{\partial c_i}{\partial h} dh + \frac{\partial c_i}{\partial r} dr + \frac{\partial c_i}{\partial w} dw$$

$$\frac{dp_i}{p_i} = \hat{p}_i = \sum_k \frac{\partial c_i}{\partial \omega_k} d\omega_k \frac{\omega_k}{\omega_k} \frac{1}{c_i} = \sum_k \theta_k \hat{\omega}_k, \quad k = T, K, L$$

where θ_k is the cost share of factor k, $\sum_k \theta_k = 1$,

$\theta_k = \frac{\partial c_i}{\partial \omega_k} \frac{\omega_k}{c_i} = \frac{a_{ik} \omega_k}{c_i}$, and a_{ik} is the unit input coefficient derived with the Shepard's lemma.

Hence a price change in good 1 becomes a weighted share of all factor prices, which implies that there must exist a factor *j* and *k* so that $\hat{\omega}_k \geq \hat{p}_i \geq \hat{\omega}_j$. This generalises the S-S theorem by saying that *for a change in the price of each good, there exist some factor that gains in real terms and another that loses* (Feenstra, p. 69). That is, trade shocks will have income distribution effects even in a more complex world then a 2-by-2 world.

b) Discuss ...

This generalisation is weaker since we could only say with certainty that each factor has a natural enemy since when the price of good 1 increases, then there will be a factor price that falls and since all other prices are unchanged the real income measured in all good prices (ω_j/p_i) falls. However, the same strong result in not found for a natural friend since we cannot say that each factor has a good so that an increase of its price will raise the real return for this factor. We could only say that an increased good price will lead to an increased real return to *some* factor (as established in a).

c) Assume ...

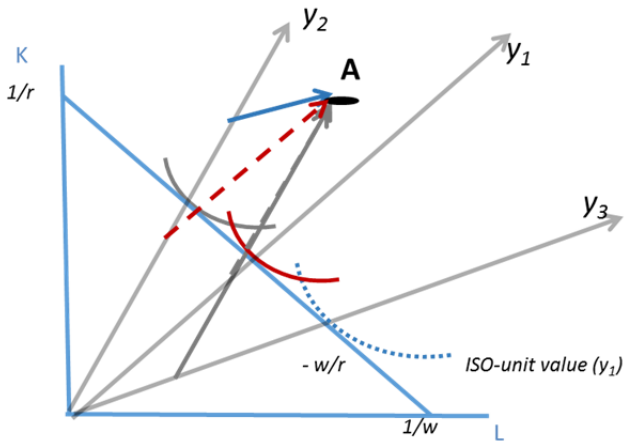
Since we are in the trade equilibrium, all good and factor prices are fixed and hence the technology (or the input coefficients) is fixed. We could therefore use the full employment condition in order to establish the production pattern within the economy:

$$\sum_i a_{ik} y_i = V_k$$

where a_{ik} is the unit-input coefficient for factor *k* in output *i*, and V_k is the supply of endowment *k* in the economy. This gives us a system of equations with three equations and three unknowns (the output of each good), which has a unique equilibrium so that all goods will be produced in this economy. Since we focus on a capital abundant economy, the mix of production will be such that it will specialise and export the capital intensive good.

d) Drop...

As soon as we have more goods than factors, the production/trade pattern becomes indeterminable since we have a full employment condition with two different equations but three unknowns. Hence we have a multiple solution to our full-employment condition, which implies that we have no predictions about the mix of production. This may be showed in a following Lerner diagram (from lecture notes, see B2b_advancement_handout.pdf slide 16), which shows that economy A could achieve full employment by producing good 2 and 3 or good 2 and 1:



Question 2:

The heterogeneous-firms model in international trade:

a) Most trade models (such as the HO or the NTT models) use a representative firm approach, which implies that firms within sectors should behave in a similar way. Give some examples (at least three) of new stylised facts calling into question the representative-firm models in international trade.
b) Give an account of the heterogeneous-firms model of Melitz (2003) in an open economy. You are not required to derive the model formally but you should discuss important assumptions and relationships behind heterogeneous-export behaviour within an industry.
c) Take your point of departure in the Melitz model and discuss the effect of a trade liberalisation on the aggregate productivity.

Answer

a) Most ...

Some of examples are; very few exporters within industries (even in export oriented industries), the exporters are skewed so that only a handful of all exporters form a majority of total exports, and

exporters do perform better since they have a higher productivity and scale compare to non-exporters.

b) Give ...

Discuss the following ingredients of the model; pool of potential entrants, all draw a random productivity level when they enter, all firms with a low productivity level could not pay for sunk costs of setting up a business and hence exit, the productive firms stay in business but face a random shock each year that leads to that a fraction of the firms exit each year.

Firms in the pool of surviving firms may export their output and hence gain a higher profit since they expand and sell on both the domestic as well as the foreign market. However, only the most efficient firms could export since each exporter has to pay for a sunk-cost of exporting, which is assumed to be larger than the sunk costs of setting up a business. Hence we face a heterogeneous behaviour on the export market as soon as the distribution of firm productivity is heterogeneous.

c) Take ...

A trade liberalisation will lead to that exporting becomes more profitable, which attracts more efficient firms and hence the demand for inputs in production increases and therefore also the factor price. This will squeeze the profit of unproductive firms and the most inefficient firms have to exit. This turnover of firms within an industry (entry of productive and exit of unproductive) due to a trade liberalisation will have a positive impact on aggregate trade. At the same time we face import competition leading to a reduced market share of domestic firms on the domestic market. Hence they have to contract. But the most productive firms expand on the foreign market and hence soak up the redundant factors of production from contracting firms focusing solely on the domestic market. Hence a larger share of the fixed resources in the economy will be employed by more productive firms, which will have an additional positive impact on aggregate productivity (i.e. the market share reallocation effect). Use a figure to illustrate these two effects. Note also that these positive effects on the aggregate productivity are independent on the firm level productivity (which remains unchanged).

Question 3:

Do you find these statements correct or not. Please elaborate on your answer in a clear and precise manner and identify the model or empirical work you refer to.

a) It is only the absolute trade costs between two countries that determines bilateral trade flows. **A: False**. The absolute bilateral trade cost is an important part in order to determine trade flows between countries but the trade flow is also influenced by the openness in the

importing and exporting country through the average price level. This was discussed by Anderson and Wincoop (2003)

b) Trade in intermediate goods implies that it becomes less relevant to compare the development of prices across sectors and more relevant to compare within sectors. **A: True**. The simple model presented in Feenstra (2004) on intermediate goods shows that a cheaper low-skilled intensive imported input used in all sectors may lead to that the price of the final good in a sector increases relative to the imported input without any obvious changes in the relative price level of final goods between sectors (which is predicted by the HO model).

c) External economies of scale is likely to lead to a situation where a larger country exploits a smaller one. **A: False**. Ethier (1987) showed that a country may lose due to that they specialise in a constant return to scale industry if the country specialising in the IRTS industry is sufficiently small in relative terms. This implies however that the inverse is true when it comes to the country specialising on the CRTS industry. The smaller it is compared to the one specialising on the IRTS industry, the smaller probability of losing from trade.

d) The Leontief paradox could be explained by unbalanced trade. **A: True**. Unbalanced trade leads to the possibility of exporting all types of factor services, which was discussed by Leamer (1980). The US trade balance was highly unbalanced after the Second World War and the surplus implied that the US exported both capital and labour services. Hence the correct way to test the HO model in this setting is to focus on the relationship between the capital intensity in production and consumption.

e) Vertical integration between a mother company and a foreign unit producing inputs is more likely in a capital then in a labour intensive industry. **A: True**. This statement is related to Antras (2003). He showed that as long as the costs of capital investment may be shared between the final good producer and a unique supplier of input but the investment in labour is controlled by the supplier, then it becomes more important to take control over this investment as long as capital forms a large part of the value added. Hence the final good producer has more incentives to take control by a vertical integration instead of outsourcing in capital intensive industries.