

TOPICS IN INTERNATIONAL TRADE: ECON 507B

October 26, 2006
Midterm Exam

Prof. Tybout

Please write your student ID at the top of each page you turn in and number each page. For example, if you use 6 pages, number them 1 of 6, 2 of 6, and so on. Do not write your name anywhere on the exam.

All questions will be weighted in proportion to their allotted time.

- 1) **(20 minutes)** Adopting the assumptions of the Melitz and Ottaviano (2005) model, explain *how* and *why* the short run effects of unilateral reductions in trade costs are likely to differ from the long run effects of trade liberalization. (Interpret short run to be a time horizon sufficiently brief that firm entry and exit are not possible.) Does empirical evidence support your explanation? In discussing the empirical literature, comment on its methodological weaknesses.

There is an inverse relationship between the number of firms and cut-off costs, c_D , in both the short run and the long run. This reflects the fact that when more firms are in the market, there is less demand for each firm. In the long run, the number of firms and the cost cut-offs are determined simultaneously in the home and foreign market by the condition that expected operating profits—due to both home and foreign sales—must match the cost of creating a new firm (the “free entry” condition). Unilateral trade liberalization in this setting increases foreign exporting profits, so entry by foreign firms responds, driving down the foreign cut-off at each domestic cut-off as the market is diced up among more competitors. At home, this entry and associated fall in foreign cut-off create losses, inducing exit and associated increases in the domestic cut-off until zero expected profits are restored. Thus there is less selection on marginal cost in the domestic market, and among the smaller set of domestic producers that survive, mark-ups are higher.

In the short run, the number of firms is fixed, but the number of active producers can adjust. When trade barriers come down, the reaction to increased foreign presence is simply an increase in competitive pressures from abroad, without an adjustment in the number of domestic firms (although some may go inactive).

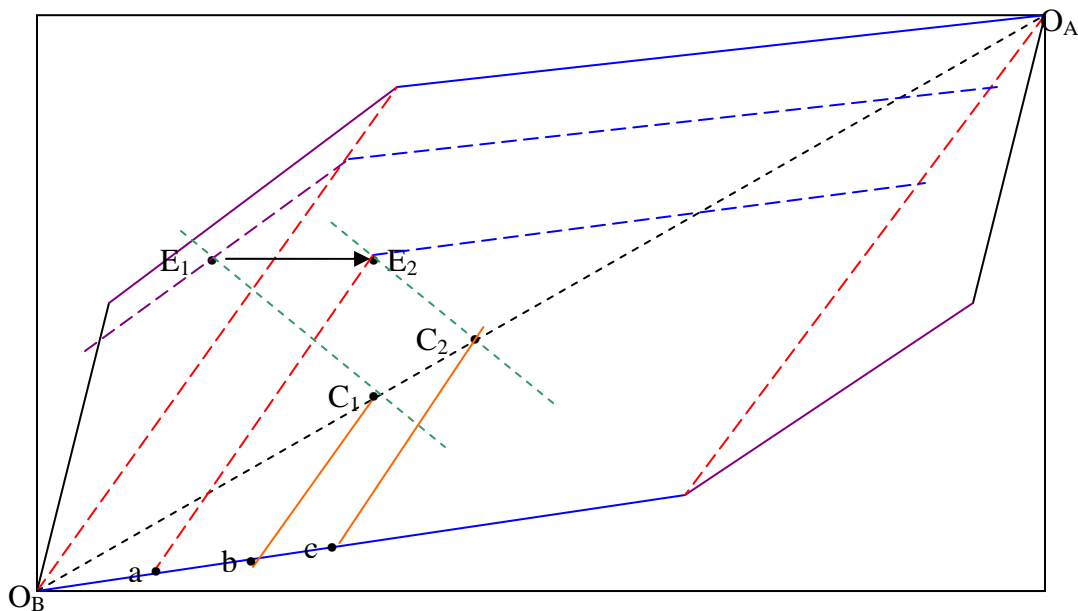
Chen, Imbs and Scott (2006) develop an error correction model that identifies long run relationships off the cointegrating (error correction) equation, and short run relationships off of short-run correlations in differenced variables. The model confirms a negative short-run relationship between mark-ups and openness, as well as a positive relationship between labor productivity and openness. It also confirms that these relationships are reversed in the long run. Practical problems with the model include the lack of direct measures for openness and for the number of firms present in a market. The model also glosses over the discrepancy between theoretical predictions, which are based on a 2-country, 2-sector model, and the data, which are industry level and describe many countries.

Other studies have used plant-level panel data to study the short-run relationship between mark-ups and import competition (e.g., Grether, 1996), firm size and import competition (e.g., Head and Reis, 1999), or import competition and productivity (e.g., Pacvnik, 2002). These studies generally confirm the predictions of Melitz-Ottaviano, although they use imperfect measures of openness. The productivity studies also suffer from a variety of measurement problems that confound other effects (like mark-up variation) with productivity variation.

- 2) (20 minutes) There are two countries in the world—A and B. Each is endowed with labor and capital. Each produces food using constant returns technologies, and each produces manufactured goods using headquarter services and final good production facilities. Country A is more labor abundant than country B.

For some exogenous reason, a significant fraction of the labor force migrates from A to B. (Country A remains the more labor-abundant country, however.) How will this trade flows and the location of headquarter services and production facilities? Answer this question first using the HK Chapter 12 model, then using the Markusen/Venables model. (For the former use an Edgeworth box; for the latter, simply describe qualitatively what you would expect to happen and why.)

There are, of course, many ways to draw the adjustment in the HK setting. One possibility is diagrammed below: At the initial endowment (E_1), some headquarter services (represented by the black lines) in B supervise production of the differentiated product (represented by the purple lines) in A. After labor migrates to A from B, the endowment point might be at E_2 . This would eliminate the incentive for geographic separation of some headquarter services from the production facilities they supervise. Both countries could produce some of the labor-intensive good (represented by blue lines), and both could produce some of the differentiated product, with headquarter services located in the same country where the production took place. (Integrated headquarter/production activities for the differentiated product are represented by red lines.) Since A would remain relatively labor-abundant, it would still produce relatively more of the homogeneous, labor-intensive good.



Clearly, A ceases to be a net importer of headquarter services. Trade in the two commodities is less obvious. Output prices and factor prices don't change, but income shifts to country B, and the implicit factor consumption point shifts from C_1 to C_2 , so B consumes more of both goods. Production *and* consumption of the homogeneous good

fall in A; both rise in B (In country B, production goes from 0 to O_{Aa} , and consumption goes from O_{Ab} to O_{Ac} .) Net changes in trade flows for this good could go either way. (As drawn, the increment to production of the homogeneous good is larger than the increment to consumption because of the positive slope of the diagonal. But imagine E_2 is just barely far enough to the right of E_1 to eliminate the need for multinationals. Then B's production of the homogenous good remains at 0 but B's demand for this good increases.)

In the Markusen-Venables (1998) model, making the labor-intensive country less labor-intensive moves the two economies toward more similar factor endowments. In contrast to the analysis above, this encourages multinational production because it reduces cross-country wage differentials, and in doing so reduces the incentives to consolidate all stages of differentiated product production (both headquarters and manufacturing) in the low wage country. When wages are equalized but transport costs are significant, multinationals do better than national firms because they can serve both the home and foreign market without incurring transport costs, *and* without incurring headquarters costs in both markets. The emergence of multinationals reduces the need for trade.

- 3) **(10 minutes)** Explain why it is inappropriate to estimate gravity equations using ordinary least squares, and ignoring those countries with zero bilateral trade flows. More precisely, explain what kinds of biases are likely to result if one fits the following equation to data on country pairs (i and j) for which imports by i from j (M_{ij}) are strictly positive:

$$\ln M_{ij} = \beta_0 + \lambda_i + \zeta_j + \gamma d_{ij} + \varepsilon_{ij}$$

(Here d_{ij} is a measure of the trade frictions separating countries i and j , including distance; λ_i and ζ_j represent country fixed effects, captured using dummy variables.)

Estimation of this equation using OLS would lead to a simultaneity bias and a selection bias. The former reflects the fact that ε_{ij} is likely to be negatively correlated with d_{ij} because when trade frictions are small, a large fraction of the firms in j are likely to export. This biases γ downward or, since γ is negative, it tends to overstate the importance of distance. The latter reflects the fact that sufficiently large d_{ij} values will shut down exports from j to i completely—that is, inclusion in the sample depends upon a variable that is negatively correlated with the disturbance. Under-representation of small ε_{ij} 's at large d_{ij} 's is likely to bias the coefficient on this variable toward zero. (Strictly speaking, the covariance of d_{ij} with the other explanatory variables also matters.)

These problems are explained in Helpman et al (2005). Using the notation of that paper, firms in country j that require a workers to produce a unit of output will export to i if they

earn positive profits by doing so; that is, if $\pi_{ij}(a) = (1 - \alpha) \left(\frac{\tau_{ij} c_j a}{\alpha P_i} \right)^{1-\varepsilon} Y_i - c_j f_{ij} > 0$.

Thus there is some cut-off a value, a_{ij} , that separates exporters from non-exporters:

$\pi_{ij}(a_{ij}) = 0$. Letting a have support $[a_L, a_H]$ and distribution $G(a_{ij})$, imports by i from j

are thus $M_{ij} = \int_{a_L}^{a_{ij}} \left(\frac{P_i(a)}{P_i} \right)^{1-\varepsilon} Y_i N_j dG(a) = \left(\frac{c_j \tau_{ij}}{\alpha P_i} \right)^{1-\varepsilon} Y_i N_j V_{ij}$, where

$V_{ij} = \begin{cases} \int_{a_L}^{a_{ij}} a^{1-\varepsilon} dG(a) & a_{ij} > a_L \\ 0 & \text{otherwise} \end{cases}$. Taking the log of this expression and comparing to the

standard gravity expression above, one sees that the disturbance $\varepsilon_{ij} \equiv \ln V_{ij}$ depends negatively on trade frictions (τ_{ij}), which are a function of transport costs (d_{ij}). Thus correlation between ε_{ij} and d_{ij} biases OLS estimates. Also, imports are zero when $a_L > a_{ij}$, so if country j faces sufficiently large trade costs when shipping to i , all of its firms will abstain from exporting to i . Thus the sample of country pairs with positive imports is truncated, and the truncation point depends upon an explanatory variable in the standard gravity model. This generates the second bias.

4) **(25 minutes)** Indicate whether each of the following is true, false, or uncertain and provide a brief explanation for your answer.

- a) Export promotion policies that subsidize export revenues on a per dollar basis are more effective at generating total export sales than export promotion policies that subsidize entry into foreign markets by non-exporting firms.

True, because revenue subsidies affect all exporting firms, while entry subsidies only affect firms on the margin between exporting and not exporting, and these latter firms tend to account for a small fraction of total exports.

- b) The sources of gains from trade that Melitz (2003) emphasizes are empirically important.

It is true that Pacvnik (2002) found the resource reallocation effects associated with trade liberalization were important. Muendler (2003) also found significant effects in Brazil. However, these studies do not really establish a structural link between openness and reallocation effects, given that important macro shocks accompany the trade reforms. (In Pacvnik's Chile study, the reforms pre-date the sample period, and the in-sample shocks were *mainly* macro.) They also suffer from an inability to distinguish price-cost mark-up effects from productivity effects. So Melitz effects *may* be empirically important, but definitive studies are yet to emerge.

c) Vertical and horizontal FDI are likely to respond the same way to trade barriers.

False, vertical FDI is encouraged by low trade barriers because this makes it relatively cheap to do different stages of production in different geographic location, shipping components at each stage. On the other hand, horizontal FDI is often done in order to service a foreign market without incurring trade costs, and this incentive becomes more important when trade barriers are high.

d) In the Melitz/Ottaviano model, the effects of a proportionate increase in country size for both countries (L and L^*) are qualitatively indistinguishable from the effects of an increase in the upper bound for the support of the cost distribution, c_M .

In the long run, the equations that determine productivity cut-offs in M/O equate expected profits to entry costs:

$$L(c_D)^{k+2} + L^*(c_D^*)^{k+2}(\tau^*)^{-k} = \gamma\phi \quad \text{and} \quad L^*(c_D^*)^{k+2} + L(c_D)^{k+2}(\tau)^{-k} = \gamma\phi$$

An increase in home country size leads to a decrease in c_D , and thus increases the number of firms based at home and the average efficiency of firms. (Things move the opposite way abroad.) In *short run*, the number of firms in each country is determined by the zero operating profit conditions, which in turn depend upon the support of the productivity distribution (c_M and c_M^*):

$$N = \bar{N}_{SR} \left(\frac{c_D}{c_M} \right)^k + \bar{N}_{SR}^* \frac{1}{\tau^k} \left(\frac{c_D}{c_M^*} \right)^k \quad \text{and} \quad N^* = \bar{N}_{SR} \left(\frac{c_D^*}{c_M^*} \right)^k + \bar{N}_{SR}^* \frac{1}{(\tau^*)^k} \left(\frac{c_D^*}{c_M} \right)^k$$

So the country size and support play similar roles, but their effects are distinguished by the time horizon. Further, an increase in c_M affects the number of firms in both countries in qualitatively the same way, while an increase in L has opposite effects in the two countries.