

Econ 8401—Fall 2010

International Trade and Payments Theory

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Homework 4

Question 1

Take the Eaton-Kortum (2002) model and make use of the equations derived there. Make any additional assumptions you need and derive the analog of the gravity equation (13) in Anderson and van Wincoop (2003).

Question 2

Consider the following special case of the Bernard Eaton Jensen Kortum model. There are three locations. Suppose $\sigma = 1$, so expenditure per good j is unit elastic. Take spending at each location x_i as exogenous. Suppose there are three locations. Let $x_j = 1$ for $j = 1$ and $j = 2$. Let $x_3 = 0$. So location 3 can produce, but it consumes nothing. To simplify notation, let

$$\gamma_i = T_i w_i^{-\theta}.$$

Keep things partial equilibrium, so γ_i is fixed. (So you can think of this application as at the level of an industry where the wage w_i is fixed.) Suppose that for $n \neq i$,

$$\alpha = d_{ni}^{-\theta}$$

where $\alpha \in (0, 1)$.

Total sales of location i can be written as

$$\begin{aligned} Q_i &= \pi_{1i}x_1 + \pi_{2i}x_2 + \pi_{3i}x_3 \\ &= (\pi_{1i} + \pi_{2i}) \end{aligned}$$

using the fact that $x_1 = x_2 = 1$ and $x_3 = 0$. As discussed in BEJK, π_{ii} is the measure of products produced at location i . Associate each product with a plant. Then the measure of plants equals

$$N_i = \pi_{ii}$$

and average plant size (measured by sales revenue) equals

$$\text{Average Size}_i = \frac{Q_i}{N_i}$$

Suppose that $\gamma_1 < \gamma_2$, so that location 2 has a comparative advantage in the production of the good.

1. Show that $Q_2 > Q_1$
2. Show that if $\alpha = 1$ (i.e. $d_{ij} = 1$), then $\text{AverageSize}_2 = \text{AverageSize}_1$.
3. Show that if $\alpha < 1$, then $\text{AverageSize}_2 > \text{AverageSize}_1$. (You can simplify here by assuming $\gamma_3 = 0$).
4. Show that

$$\frac{Q_2}{Q_1}$$

strictly increases in γ_3 . (Simplify notation by letting $\lambda = \alpha\gamma_3$ and showing that the output ratio above increases in λ). Note this is a Melitz like result, in that location 2 with the big plants increases market share relative to the small plant location 1, with the advent of the competition from location 3.

Question 3

(While we didn't cover the material for this question in class, students of international trade should be familiar with optimal tariff problems. This is a slight variation of question III.1 of the fall 2006 field prelim.)

A tariff war in a Ricardian model with a continuum of goods

Consider an economy in which there are two countries and a continuum of goods indexed $z \in [0, 1]$. Goods are produced using labor:

$$y_j(z) = \ell_j(z)/a_j(z).$$

where

$$\begin{aligned} a_1(z) &= e^{\alpha z} \\ a_2(z) &= e^{\alpha(1-z)}. \end{aligned}$$

Here $y_j(z)$ is the production of good z in country j and $\ell_j(z)$ is the input of labor. The stand-in consumer in each country has the utility function

$$\int_0^1 \log c_j(z) dz.$$

This consumer is endowed with $\bar{\ell}_j$ units of labor where $\bar{\ell}_1 = \bar{\ell}_2 = \bar{\ell}$.

1. Define an equilibrium of the economy. Calculate expressions for all of the equilibrium prices and quantities. Draw a graph that illustrates the pattern of specialization in production and trade.
2. Suppose that the two countries engage in a tariff war in which each country imposes an ad valorem tariff on imports from the other country. Define an equilibrium of the economy. Calculate expressions for all of the equilibrium prices and quantities. Draw a graph that illustrates the pattern of specialization in production and trade.
3. Calculate gross domestic product, exports, and the real income index

$$\nu_j = \exp \int_0^1 \log c_j(z) dz$$

as functions of τ .