ECO 745: Theory of International Economics

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Old Trade Theory

Previous trade theories focused on differences between countries

- Ricardian: Differences in technology
- Heckscher-Ohlin: Differences in endowments
- Armington: Differences in type of goods produced

In the above, countries only trade because they are different. If countries are the same then gains from trade go away.

New Trade Theory (NTT)

New Trade Theory focused on why similar countries might trade. This is important as:

- A large portion of trade occurs between similar countries without obvious differences in comparative advantage or factor endowments

- Likewise, a significant portion of trade is two-way trade of the same product types.

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To explain the above the basic model contains the following key elements:

- Imperfect competition
- Product differentiation
- Increasing returns to scale

Basic Monopolistic Competition Setup

Krugman (1980):

- $i, j = 1, \ldots, N$ Countries, continuum of goods $m \in M$
- Consumers have CES preferences over goods

$$U_j = \left(\int_{m \in M} \left(c_j(m) \right)^{\rho} dm \right)^{\frac{1}{\rho}}$$

Where $\sigma = \frac{1}{1-\rho}$ is the elasticity of substitution $(0 < \rho < 1)$

Household Demand

Consumers in country j solve

$$\max_{\{c_j(m)\}} \left(\int_{m \in M} \left(c_j(m) \right)^{\rho} dm \right)^{\frac{1}{\rho}}$$

subject to budget constraint:

$$\int_{m \in M} p_j(m) c_j(m) = w_j L_j + \pi_j$$

where $w_j L_j + \pi_j = I_j$ is the income of households in country j (π_j is firm profits redistributed back to consumers)

Deriving Household Demand: Alternative Method

To derive demand, take FOC

$$[c_j(m)]: \left(\int_{m\in M} \left(c_j(m)\right)^{\rho} dm\right)^{\frac{1}{\rho}-1} \left(c_j(m)\right)^{\rho-1} = \lambda_j p_j(m)$$

Take ratio of FOC for arbitrary goods $c_j(m)$ and $c_j(k)$, $\mathrm{m} \neq k$

$$\frac{\left(\int_{m\in M} \left(c_j(m)\right)^{\rho} dm\right)^{\frac{1}{\rho}-1} \left(c_j(m)\right)^{\rho-1}}{\left(\int_{k\in M} \left(c_j(k)\right)^{\rho} dk\right)^{\frac{1}{\rho}-1} \left(c_j(k)\right)^{\rho-1}} = \frac{\lambda_j p_j(m)}{\lambda_j p_j(k)}$$

Cancelling terms and rearranging

$$\left(c_j(m)\right)^{\rho-1} = \frac{p_j(m)}{p_j(k)} \left(c_j(k)\right)^{\rho-1}$$

Deriving Household Demand: Alternative Method

Take both sides to the $1/(\rho - 1)$ power:

$$c_j(m) = \left(\frac{p_j(m)}{p_j(k)}\right)^{\frac{1}{\rho-1}} c_j(k)$$

Substitute above into budget constraint and simplify

$$\int_{m\in M} p_j(m) \left(\frac{p_j(m)}{p_j(k)}\right)^{\frac{1}{\rho-1}} c_j(k)\, dm = w_j L_j + \pi_j$$

$$\frac{c_j(k)}{\left(p_j(k)\right)^{\frac{1}{\rho-1}}} \int_{m\in M} \left(p_j(m)\right)^{\frac{\rho}{\rho-1}}\, dm = w_j L_j + \pi_j$$

$$c_j(k) = \frac{w_j L_j + \pi_j}{\left(p_j(k)\right)^{\frac{1}{1-\rho}} \int_{m\in M} \left(p_j(m)\right)^{\frac{-\rho}{1-\rho}} dm}$$

Deriving Household Demand: Using CES price index

Can confirm it gives same answer as directly using the CES price index we derived earlier. Write:

$$c_j(k) = \frac{w_j L_j + \pi_j}{\left(p_j(k)\right)^{\frac{1}{1-\rho}} \left(\left(\int_{m \in M} \left(p_j(m)\right)^{\frac{-\rho}{1-\rho}} dm \right)^{-\left(\frac{1-\rho}{\rho}\right)} \right)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

Then recall the formula for the CES price index (P_j such that $U_j = I_j / P_j$) :

$$P_j = \left(\int_{m \in M} \left(p_j(m)\right)^{-\left(\frac{\rho}{1-\rho}\right)} dm \right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

Then we have that

$$c_j(k) = \frac{w_j L_j + \pi_j}{\left(p_j(k)\right)^{\frac{1}{1-\rho}} \left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

Firm Maximization Problem

- No longer assume perfect competition, each good is produced by a single monopolist.
- Firms pay a fixed cost, f, in terms of labor in order to produce, and have productivity z
- Taking demand as given, firms maximize profits

$$\max_{p(m)} p(m)y(m) - wl(m)$$

Subject to production function (for $y(m) > 0$)

$$y(m) = \max\{z(l(m) - f), 0\}$$

Firm Maximization Problem

- Suppose $y(m) > 0$, then $l(m) = y(m)/z + f$. Therefore the firm maximization problem is:

$$\max_{p(m)} p(m)y(m) - w\frac{y(m)}{z} - wf$$

- Note also from demand function:

$$c_j(k) = \frac{w_j L_j + \pi_j}{\left(p_j(k)\right)^{\frac{1}{1-\rho}} \left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

- Suppose we are in autarky, then $c_j(m) = y(m)$. Therefore the maximization problem becomes

$$\max_{p_j(m)} \left(p_j(m) - \frac{w_j}{z}\right)\left(\frac{w_j L_j + \pi_j}{\left(p_j(m)\right)^{\frac{1}{1-\rho}} \left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}}\right) - w_j f$$

Solving for Firm Prices

$$\max_{p_j(m)} \left(p_j(m)\right)^{\frac{-\rho}{1-\rho}} \frac{w_j L_j + \pi_j}{\left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}} - \left(p_j(m)\right)^{\frac{-1}{1-\rho}} \frac{w_j}{z} \frac{w_j L_j + \pi_j}{\left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}} - w_j f$$

To solve for prices take FOC of the above

$$[p_j(m)]: \left(-\frac{\rho}{1-\rho}\right)\left(p_j(m)\right)^{\frac{-\rho}{1-\rho}-1} \frac{w_j L_j + \pi_j}{\left(P_j\right)^{\frac{-\rho}{1-\rho}}} - \left(\frac{-1}{1-\rho}\right)\left(p_j(m)\right)^{\frac{-1}{1-\rho}-1} \left(\frac{w_j}{z}\right) \frac{w_j L_j + \pi_j}{\left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}} = 0$$

Simplifying yields:

$$(\rho)\left(p_j(m)\right)^{\frac{-1}{1-\rho}} - \left(p_j(m)\right)^{\frac{\rho-2}{1-\rho}} \left(\frac{w_j}{z}\right) = 0$$

$$(\rho) p_j(m) - \left(\frac{w_j}{z}\right) = 0$$

$$p_j(m) = \left(\frac{w_j}{\rho z}\right)$$

Firm Prices and Profits

Note that prices no longer equal to marginal cost. Now price is a markup over marginal cost

$$p = \overbrace{\rho^{-1}}^{\text{markup}} \quad \overbrace{(w/z)}^{\text{marginal cost}}$$

Therefore, possible that firms can make profits. Profits given by:

$$\pi_j(m) = p_j(m)y_j(m) - w_j l_j(m) = \left(\frac{w_j}{\rho z} - \frac{w_j}{z}\right)\left(\frac{w_j L_j + \pi_j}{\left(\frac{w_j}{\rho z}\right)^{\frac{1}{1-\rho}} (P_j)^{-\left(\frac{\rho}{1-\rho}\right)}}\right) - w_j f$$

Plugging prices into price index yields (suppose mass of firms is μ):

$$P_j = \left(\int_{m \in M} \left(\frac{w_j}{\rho z}\right)^{-\left(\frac{\rho}{1-\rho}\right)} dm\right)^{-\left(\frac{1-\rho}{\rho}\right)} = \frac{w_j}{\rho z}\left(\int_{m \in M} dm\right)^{-\left(\frac{1-\rho}{\rho}\right)} = \frac{w_j}{\rho z}\mu^{-\left(\frac{1-\rho}{\rho}\right)}$$

Firm Profits with Fixed Mass of Firms

With mass of firms fixed at μ then profits of each firm equal to:

$$\pi_j(m) = \left(\frac{w_j}{\rho z} - \frac{w_j}{z}\right)\left(\frac{w_j L_j + \pi_j}{\left(\frac{w_j}{\rho z}\right)^{\frac{1}{1-\rho}}\left(\frac{w_j}{\rho z}\mu^{-\left(\frac{1-\rho}{\rho}\right)}\right)^{-\left(\frac{\rho}{1-\rho}\right)}}\right) - w_j f$$

$$= \left(\frac{w_j}{\rho z}(1-\rho)\right)\left(\frac{w_j L_j + \pi_j}{\left(\frac{w_j}{\rho z}\right)^{\frac{1}{1-\rho}}\left(\frac{w_j}{\rho z}\right)^{-\left(\frac{\rho}{1-\rho}\right)}\mu}\right) - w_j f$$

$$= \frac{(1-\rho)}{\mu}\left(w_j L_j + \pi_j\right) - w_j f$$

Total Profits with Fixed Mass of Firms

To solve for total profits, we integrate over firm profits

$$\pi_j = \int_{m\in M} \pi_i(m)dm = \int_{m\in M} \left(\frac{(1-\rho)}{\mu}\left(w_j L_j + \pi_j\right) - w_j f\right)dm = (1-\rho)\left(w_j L_j + \pi_j\right) - w_j f \mu$$

And then solve the above for π_j

$$\pi_j = (1-\rho)\left(w_j L_j + \pi_j\right) - w_j f \mu$$

$$\pi_j - (1-\rho)\pi_j = (1-\rho)\left(w_j L_j\right) - w_j f \mu$$

$$\pi_j = \frac{(1-\rho)\left(w_j L_j\right) - w_j f \mu}{\rho}$$

Which means total income is:

$$I_j \coloneqq w_j L + \pi_j = \overbrace{w_j}^{\text{wages}} \ \overbrace{\rho^{-1}}^{\text{markup}} \ \overbrace{\left(L_j - f\mu\right)}^{\substack{\text{labor minus} \\ \text{fixed costs}}}$$

Output and Labor Allocation

Substituting prices and income into the output demand gives output per firm of:

$$c_j(k) = \frac{w_j L_j + \pi_j}{\left(p_j(k)\right)^{\frac{1}{1-\rho}} \left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}} = \frac{\left(w_j/\rho\right)\left(L_j - f\mu\right)}{\left(\frac{w_j}{\rho z}\right)^{\frac{1}{1-\rho}} \left(\frac{w_j}{\rho z}\mu^{-\left(\frac{1-\rho}{\rho}\right)}\right)^{\frac{-\rho}{1-\rho}}} = \frac{z}{\mu}\left(L_j - f\mu\right)$$

And we can confirm that Walras' Law holds and the labor market clears

$$L_j = \int_{m\in M} l_j(m)\, dm = \int_{m\in M} \left(\frac{1}{z}\left(\frac{z}{\mu}\left(L_j - f\mu\right)\right) + f\right) dm = \left(L_j - f\mu\right) + f\mu = L_j$$

Free Entry

Suppose we allow free entry. Firms will enter until profits go to zero, which means:

$$\pi_j = \frac{(1-\rho)\left(w_j L_j\right) - w_j f \mu}{\rho} = 0$$

Therefore the mass of firms that will produce under free entry will be given by:

$$\mu = (1-\rho)\left(\frac{L_j}{f}\right)$$

And therefore income is $w_j L_j + \pi_j = w_j L_j$, and output per firm is:

$$c_j(k) = \frac{z}{\mu}\left(L_j - f\mu\right) = \frac{zL_j}{\left((1-\rho)\left(\frac{L_j}{f}\right)\right)} - zf = \left(\frac{\rho}{1-\rho}\right)zf$$

Free Trade

Now suppose that the $i, j = 1, \dots, N$ countries engage in free trade

- Free trade therefore prices will be equal across countries $\Rightarrow p_j(m) = p(m)$ and $P_j = P, \ \forall j, m$

Total output for a good m produced in country j will be equal to total demand:

$$Y_j(m) = \sum_{i=1}^{N} c_i(m) = \frac{\sum_{i=1}^{N}(w_i L_i + \pi_i)}{\left(p(m)\right)^{\frac{1}{1-\rho}} (P)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

CES Price Index under Free Trade

Firms will still charge a constant markup over marginal cost, therefore:

$$P_j = \left(\sum_{j=1}^{N} \int_{m \in M_j} \left(\frac{w_j}{\rho z} \right)^{-\left(\frac{\rho}{1-\rho}\right)} dm \right)^{-\left(\frac{1-\rho}{\rho}\right)} = \frac{1}{\rho z} \left(\sum_{j=1}^{N} \left(w_j\right)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j \right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

Therefore total output for firm m in country j will be:

$$Y_j(m) = \frac{\sum_{i=1}^{N} (w_i L_i + \pi_i)}{\left(\frac{w_j}{\rho z}\right)^{\frac{1}{1-\rho}} \left(\frac{1}{\rho z} \left(\sum_{j=1}^{N} \left(w_j\right)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j \right)^{-\left(\frac{1-\rho}{\rho}\right)} \right)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

$$Y_j(m) = \frac{\sum_{i=1}^{N} (w_i L_i + \pi_i)}{\left(\frac{1}{\rho z}\right) \left(w_j\right)^{\frac{1}{1-\rho}} \sum_{j=1}^{N} \left(w_j\right)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j}$$

Free Trade and Free Entry

Assume there is free entry, then $\pi_i = 0$ and the total amount of labor used by each firm is:

$$L_j(m) = \frac{Y_j(m)}{z} + f = \left(\frac{\sum_{i=1}^{N} w_i L_i}{\left(\frac{1}{\rho}\right) \left(w_j\right)^{\frac{1}{1-\rho}} \sum_{j=1}^{N} \left(w_j\right)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j} \right) + f$$

Labor clearing means that

$$L_j = \int_{m \in M_j} L_j(m) dm = \rho \left(\frac{\sum_{i=1}^{N} w_i L_i}{\sum_{j=1}^{N} \left(w_j\right)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j} \right) \left(w_j\right)^{\frac{-1}{1-\rho}} \mu_j + f \mu_j$$

Symmetry and Free Entry

Assume that countries are symmetric, then $w_j = 1 \; \forall j$. Therefore labor clearing becomes

$$L_j = \rho \left(\frac{\sum_{i=1}^{N} L_i}{\sum_{j=1}^{N} \mu_j} \right) \mu_j + f \mu_j$$

Summing over j gives us that

$$\sum_{j=1}^{N} L_j = \rho \left(\frac{\sum_{i=1}^{N} L_i}{\sum_{j=1}^{N} \mu_j} \right) \sum_{j=1}^{N} \mu_j + f \sum_{j=1}^{N} \mu_j$$

And therefore

$$\sum_{j=1}^{N} \mu_j = \frac{(1-\rho)}{f} \sum_{j=1}^{N} L_j$$

Symmetry and Free Entry

Putting $\sum_{j=1}^{N} \mu_j$ into the labor clearing gives

$$L_j = \rho \left(\frac{\sum_{i=1}^{N} L_i}{\frac{(1-\rho)}{f} \sum_{j=1}^{N} L_j} \right) \mu_j + f \mu_j$$

And solving for μ_j yields:

$$L_j = \left(\frac{\rho}{1-\rho} \right) f \mu_j + f \mu_j$$

$$\mu_j = (1-\rho) \frac{L_j}{f}$$

So the mass of firms that enters is the same under autarky and free trade

- Similarly, the relative prices of all goods stay the same too ($p_j(m)/w_j$)

Welfare

Note that GDP is unchanged after opening to trade as $\mu_j^{autarky} = \mu_j^{trade}$:

$$GDP = w_j L_j + \pi_j = w_j \rho^{-1}(L_j - f\mu_j)$$

Consumers are still better off under trade as they consume a wider variety of goods.

- Can see this with the CES price index. Recall $U_j = I_j / P_j$ and

$$P_j^{trade} = \frac{1}{\rho z}\left(\sum_{j=1}^{N} \mu_j\right)^{-\left(\frac{1-\rho}{\rho}\right)} < \frac{1}{\rho z}\left(\mu_j\right)^{-\left(\frac{1-\rho}{\rho}\right)} = P_j^{autarky}$$

Trade Flows

Consumers will spend an equal amount on each firm's output.

The share of income devoted to domestic goods is $\frac{\mu_j}{\sum_{j=1}^{N} \mu_j}$ and to imports is $1 - \frac{\mu_j}{\sum_{j=1}^{N} \mu_j}$

One thing to note:

- Trade flows and direction of trade conditional on production are deterministic
- Depending how product differentiation is set up, the set of goods produced by each firm may be indeterministic. However, this indeterminacy doesn't affect anything in this framework.

Iceburg Trade Costs

Assume we have a symmetric iceburg trade cost for all countries, $\tau - 1 > 0$

Then the production function for firm m exporting from country j to country i, $i \neq j$, becomes

$$y_j^i(m) = \max\left\{\frac{z}{\tau}(l(m) - f), 0\right\}$$

and the marginal cost of exporting one unit is $\tau \frac{w_j}{z}$.

Prices with Trade Costs

Prices will still be a markup over marginal cost, therefore

$$p_j^i(m) = \begin{cases} \dfrac{w_j}{\rho z}, & i = j \\ \dfrac{\tau w_j}{\rho z}, & i \neq j \end{cases}$$

Plugging prices into price index yields:

$$P_j = \left(\int_{m \in M_j} \left(\frac{w_j}{\rho z} \right)^{-\left(\frac{\rho}{1-\rho}\right)} dm + \sum_{\substack{i=1 \\ i \neq j}}^{N} \int_{m \in M_i} \left(\frac{\tau w_i}{\rho z} \right)^{-\left(\frac{\rho}{1-\rho}\right)} dm \right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

$$= \frac{1}{\rho z} \left((w_j)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_j + \tau^{-\left(\frac{\rho}{1-\rho}\right)} \sum_{\substack{i=1 \\ i \neq j}}^{N} (w_i)^{-\left(\frac{\rho}{1-\rho}\right)} \mu_i \right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

Prices with Trade Costs and Symmetry

Under symmetry $w_j = 1$ and the price index therefore becomes

$$P_j = \frac{1}{\rho z}\left(\mu_j + \tau^{-\left(\frac{\rho}{1-\rho}\right)}\sum_{\substack{i=1\\ j\neq i}}^{N}\mu_i\right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

And therefore demand in country i for output from firm m located in country j is (for $i \neq j$):

$$y_j^i(m) = \frac{w_i L_i + \pi_i}{\left(p_j^i(m)\right)^{\frac{1}{1-\rho}}(P_i)^{-\left(\frac{\rho}{1-\rho}\right)}} = \frac{w_i L_i + \pi_i}{(\tau)^{\frac{1}{1-\rho}}\left(\frac{1}{\rho z}\right)\left(\mu_i + \tau^{-\left(\frac{\rho}{1-\rho}\right)}\sum_{j=1, j\neq i}^{N}\mu_j\right)}$$

And due to symmetry we'll have $\mu_j = \mu, \forall j$, therefore:

$$y_j^i(m) = \frac{L_i + \pi_i}{(\tau)^{\frac{1}{1-\rho}}\left(\frac{1}{\rho z}\right)\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1) + 1\right)\mu}$$

Labor Clearing Under Free Entry

Under free entry we have $\pi_i = 0$ again, and labor used by each firm is (note $L_j = L$)

$$L_j(m) = \frac{y_j^j}{z} + \sum_{\substack{i=1 \\ i \neq j}}^{N} \tau \frac{y_j^i}{z} + f = \frac{L + (\tau)^{\frac{-\rho}{1-\rho}}(N-1)L}{\left(\frac{1}{\rho}\right)\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)\mu} + f$$

Labor clearing means that

$$L_j = L = \int_{m \in M_j} L_j(m)dm = \rho\left(\frac{L + (\tau)^{\frac{-\rho}{1-\rho}}(N-1)L}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)\mu}\right)\mu + f\mu$$

Mass of Firms Under Free Entry

From Labor clearing we have:

$$L = \rho\left(\frac{L + (\tau)^{\frac{-\rho}{1-\rho}}(N-1)L}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)}\right) + f\mu$$

Rearranging:

$$f\mu = L\left(1 - \rho\left(\frac{1 + (\tau)^{\frac{-\rho}{1-\rho}}(N-1)}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)}\right)\right)$$

Therefore the mass of firms that enter in each country are equal to

$$\mu = \frac{L}{f}(1-\rho)\left(\frac{(\tau)^{\frac{-\rho}{1-\rho}}(N-1)+1}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)}\right) = \frac{L}{f}(1-\rho)$$

Welfare with Trade Costs

Have same number of firms that enter in each country regardless of trade costs

However, welfare decreases as trade costs increase, as

$$P_j = \frac{1}{\rho z}\mu^{-\left(\frac{1-\rho}{\rho}\right)}\left(1+\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)\right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

Therefore P increases as τ increases ($\tau \uparrow \Rightarrow \tau^{-\left(\frac{\rho}{1-\rho}\right)} \downarrow \Rightarrow P_j \uparrow$)

Trade Flows with Trade Costs

No longer spend the same amount on each good.

$$\frac{p_j^i(m)y_j^i(m)}{L} = \left(\frac{\tau}{\rho z}\right)\frac{1}{(\tau)^{\frac{1}{1-\rho}}\left(\frac{1}{\rho z}\right)\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)\mu} = \frac{(\tau)^{-\left(\frac{\rho}{1-\rho}\right)}}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)\mu}$$

Integrating over $m \in M_j$ and summing over $j \neq i$ gives:

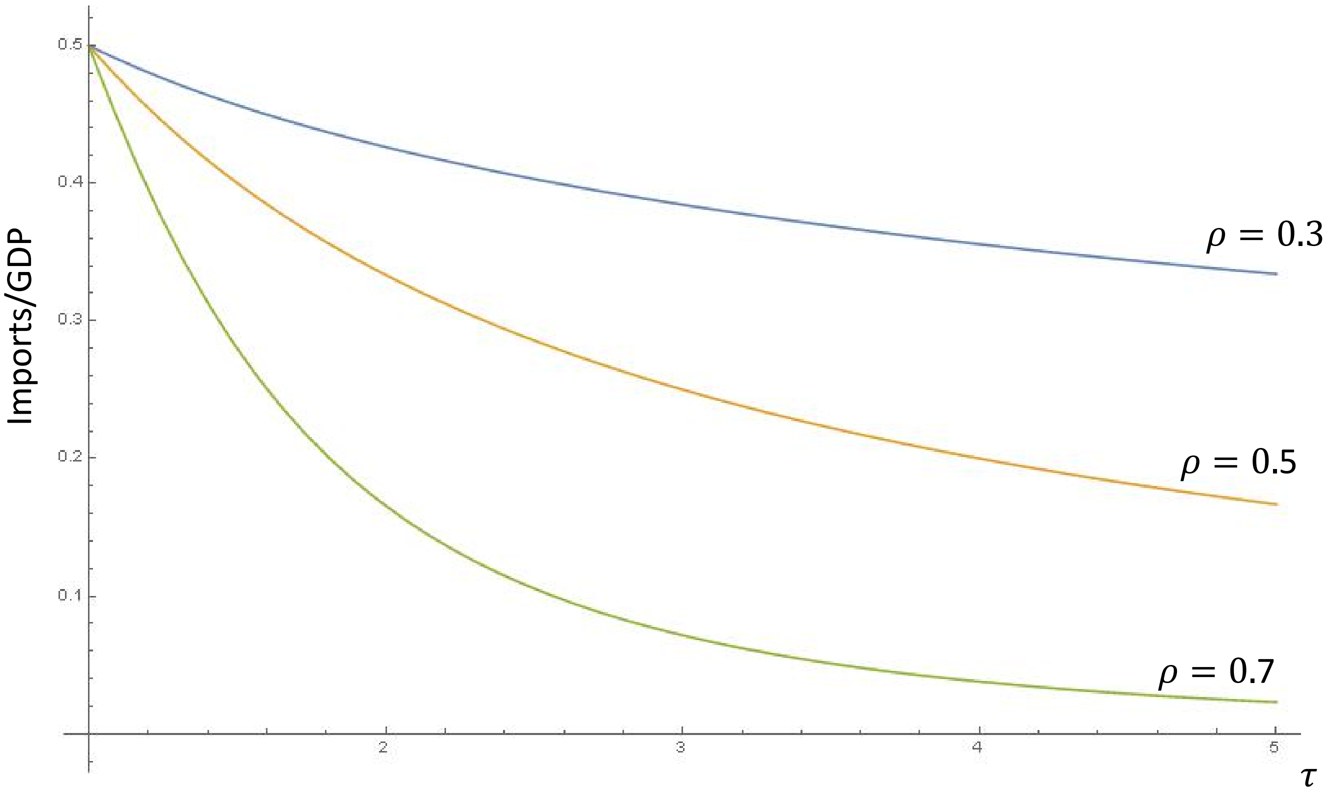
$$\frac{Imports}{GDP} = \frac{(\tau)^{-\left(\frac{\rho}{1-\rho}\right)}\mu(N-1)}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)\mu} = \frac{(\tau)^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}(N-1)+1\right)}$$

Suppose $N = 2$, then have that:

$$\frac{Imports}{GDP} = \frac{(\tau)^{-\left(\frac{\rho}{1-\rho}\right)}}{\left(\tau^{-\left(\frac{\rho}{1-\rho}\right)}+1\right)}$$

Imports/GDP versus Trade Costs $(N = 2)$

Note: A higher elasticity magnifies the effects of trade barriers



Imperfect Competition with a Finite Number Firms

Suppose instead of having a continuum of firms, we have a finite number

M goods, N countries, consumers in country j solve

$$\max_{\{c_{mj}\}} \left(\sum_{m=1}^{M} (c_{mj})^{\rho} \right)^{\frac{1}{\rho}}$$

subject to their budget constraint:

$$\sum_{m=1}^{M} p_{mj} c_{mj} = w_j L_j + \pi_j$$

Imperfect Competition with a Finite Number Firms

From consumer's problem we will still have that

$$c_{kj} = \frac{w_j L_j + \pi_j}{\left(p_{kj}\right)^{\frac{1}{1-\rho}} \left(P_j\right)^{-\left(\frac{\rho}{1-\rho}\right)}}$$

However, markups will not be as same, as the price index will be a sum rather than an integral

$$P_j = \left(\sum_{m=1}^{N} \left(p_{mj}\right)^{-\left(\frac{\rho}{1-\rho}\right)} \right)^{-\left(\frac{1-\rho}{\rho}\right)}$$

Therefore firm m will be able to affect the consumer's price index and will take that into account