International agricultural markets, trade and development

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Readings

Some references I will use:

- Marc J. Meliz, The Impact of Trade on Intra-Industry Reallocations and aggregative industry productivity, *Econometrica*, Vol. 71, No. 6 (November 2003), 1695-1725.
- Jonathan I. Dingel, The basic of 'Dizit-Stiglitz, lite', June 2009 (`http:www.columbia.edu/~jid2106/td/dixitstiglitzbasics.pdf`)
- Dixit, Avinash K. and Stiglitz, Joseph E. (1977): ?Monopolistic Competition and Optimum Product Diversity?. *American Economic Review* 67(3), 297?308.
- Hugo A. Hopenhayn Entry, Exit, and firm Dynamics in Long Run Equilibrium, *Econometrica*, Vol. 60, No. 5 (Sep., 1992), pp. 1127-1150

Thanks for listening!

Background

- Heterogeneous firms
- firms vary in terms of productivity as do Farms.
- Some farms and agribusinesses are more productive than others
- More productive firms and farms tend to export and the less productive firms and farms tend to serve the domestic market, why?
- Monopolistic competition

Agricultural products: From homogeneous to heterogeneous products

- Traditional view: Agricultural products are homogeneous goods (commodities)
- Product grades/quality
- Biotech, plant and animal breeding
- Small noche agricultural producers: organic production, certification of organic production
- Agricultural products are increasingly heterogeneous

Dixit-Stiglitz Preferences

$$U = U(x_0, \left\{ \sum_{i}^{n} x_i^{\rho} \right\}^{\frac{1}{\rho}}$$

Budget constraint

$$x_0 + \sum_{i=1}^{n} p_i x_i = I$$

Continuum of goods

Consumers have a preference for product variety

$$U = \left(\int_0^n q(\omega)^\rho d\omega \right)^{\frac{1}{\rho}}, 0 \leq \rho \leq 1$$

- n mass (the word mass is used because we have a continuum of varieties, i.e. varieties aren't countable) of product varieties
- $q(\omega)$ consumption of variety ω
- ρ is a measure of substitutability, Dixit-Stiglitz preferences generalize CES preferences to a continuum of goods.
- Consumers have a taste for variety (convexity property)

Budget constraint

$$I = \int_0^n p(\omega) q(\omega) d\omega$$

Consumer problem

$$L(q,\lambda) = U^{\rho} + \lambda \left[I - \int_0^n p(\omega) q(\omega) d\omega \right]$$

First-order conditions:

$$\frac{\partial L}{\partial q(\omega)} = \rho q(\omega)^{\rho - 1} - \lambda p(\omega) = 0$$

Frisch demand function:

$$q(\omega) = \left(\frac{\lambda p(\omega)}{p} \right)^{\frac{1}{\rho - 1}}$$

Problem: This still contains λ it is not a closed-form solution.
Idea: Take ratio of "point" varieties:

$$\frac{q(\omega_1)}{q(\omega_2)} = \left(\frac{p(\omega_1)}{p(\omega_2)} \right)^{\frac{1}{\rho - 1}}$$

Set $\sigma \equiv \frac{1}{\rho - 1}$

$$q(\omega_1) = q(\omega_2)(\frac{p(\omega_1)}{p(\omega_2)})^{-\sigma}$$

Multiply by $p(\omega_1)$

$$p(\omega_1)q(\omega_1) = p(\omega_1)q(\omega_2)(\frac{p(\omega_1)}{p(\omega_2)})^{-\sigma}$$

$$\int_0^n p(\omega_1)q(\omega_1)d\omega_1 = \int_0^n p(\omega_1)^{1-\sigma}q(\omega_2)p(\omega_2)^{\sigma}d\omega_1$$

The left-hand side is just I, the right hand-side can be simplified to get:

$$I = q(\omega_2)p(\omega_2)^{\sigma}\int_0^n p(\omega_1)^{1-\sigma}d\omega_1$$

divide by $p(\omega_2)^{\sigma}\int_0^n p(\omega_1)^{1-\sigma}d\omega_1$ to get:

$$q(\omega_2) = \frac{Ip(\omega_2)^{-\sigma}}{\int_0^n p(\omega_1)^{1-\sigma}d\omega_1}$$

This is the Marshallian (usual) demand function.

Aggregate Price

$$P = \left[\int_0^n p(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}$$

so

$$P^{1-\sigma} = \int_0^n p(\omega)^{1-\sigma} d\omega$$

substituting back into $q(\omega_2)$:

$$q(\omega_2) = \frac{Ip(\omega_2)^{-\sigma}}{\int_0^n p(\omega_1)^{1-\sigma} d\omega_1} = \frac{Ip(\omega_2)^{-\sigma}}{P^{1-\sigma}} = Q\left(\frac{p(\omega_2)}{P}\right)^{-\sigma}$$

where $Q = \frac{I}{P}$.

Production in the Melitz Model

- There are a continuum of firms
- Each firm produces a different variety ω. These could be for example genetically different crop varieties, different blends, etc.
- One factor of production, labor, labor supply is inelastic.
- Revenue is $PQ = \int_0^n r(\phi) d\omega$

Cost and the Lerner Markup Pricing rule

Costs are constant marginal cost with productivity levels ϕ which lower output this results in the following input requirement function:

$$l = f + \frac{q}{\phi}$$

where f is the fixed cost and q output.
Costs are therefore

$$C(q) = wl = wf + w\frac{q}{\phi}$$

Profit maximization gives

$$\pi(q) = p(q)q - c(q) = p(q)q - wf - w\frac{q}{\phi}$$

$$p'q + p(q) - \frac{w}{\phi} = 0$$

Mark-up pricing

Divide by $p(q)$

$$p'\frac{q}{p(q)} + 1 - \frac{w}{p(q)\phi} = 0$$

$$p'\frac{q}{p(q)} + 1 = \frac{w}{p(q)\phi}$$

Now elasticity is

$$|q'(p)\frac{p}{q}| = \sigma$$

and therefore

$$p'(q)\frac{q}{p} = -\frac{1}{\sigma}$$

substituting into and using absolute value

$$p' \frac{q}{p(q)} + 1 = \frac{w}{p(q)\phi}$$

gives

$$-\frac{1}{\sigma} + 1 = \frac{w}{p(q)\phi}$$

or

$$\sigma - 1 = \sigma \frac{w}{p(q)\phi}$$

This can be rearranged to get

$$p(q) = \frac{\sigma}{\sigma - 1} \frac{w}{\phi}$$

This is the Lerner Markup pricing rule from Monopoly pricing.
Then using $\frac{\sigma}{\sigma-1} = \rho$ (see definition) we get

$$p(q) = \frac{w}{\rho\phi}$$

we will set $w = 1$ in what follows

$$\pi(\phi) = r(\phi) - l(\phi)$$

$$= \frac{r(\phi)}{\sigma} - f$$

From consumer demand $q(\omega) = Q\left[\frac{p(\omega)}{P}\right]^{-\sigma}$.
So expenditure is (careful with the exponent, some stuff going on in the background here)

$$r(\omega) = PQ\left[\frac{p(\omega}{P}\right]^{-\sigma} = R\left[\frac{p(\omega}{P}\right]^{1-\sigma}$$

Mark-up pricing

Now use the Markup-pricing rule $p(\omega) = \frac{w}{\rho\phi}$ (watch carefully sleight of hand used here) and substitute this

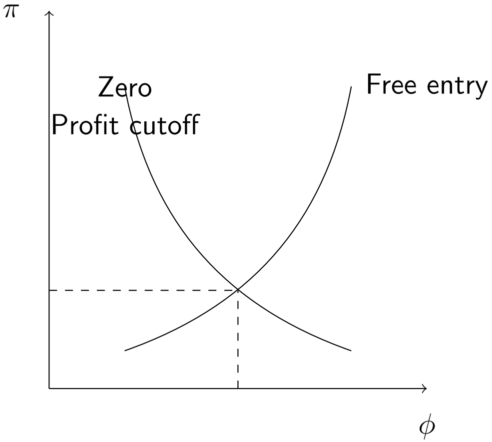
$$r(\phi) = R\left[\frac{\frac{w}{\rho\phi}}{P}\right]^{1-\sigma} = R\left[\frac{w}{P\rho\phi}\right]^{1-\sigma}$$

Set $w = 1$ and simplify

$$r(\phi) = R\left[P\rho\phi\right]^{\sigma-1}$$

So $\pi(\phi) = \frac{R}{\sigma}\left[P\rho\phi\right]^{\sigma-1} - f$

Equilibrium average profit and productivity cutoff



Open economy Model