

The New Trade Theory

Monopolistic competition in trade

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Topic 4

Monopolistic competition

Main characteristics and insights:

- ▶ Many firms use **differentiation strategies** to reduce market aggressiveness.
- ▶ With increasing returns production in differentiated products might be spatially concentrated: this can explain the emergence of 'brands'.
- ▶ **Free entry and exit**, n tends to be large and this reduces the role of strategic interaction.
- ▶ It is interesting to study the effect of trade on competition (n should varies)
- ▶ Consumers like to differentiate their consumption
- ▶ Let's start from these last two points: (a) Free entry and (b) the Dixit-Stiglitz (1977) Utility function.

Part I

Monopolistic competition: Free entry

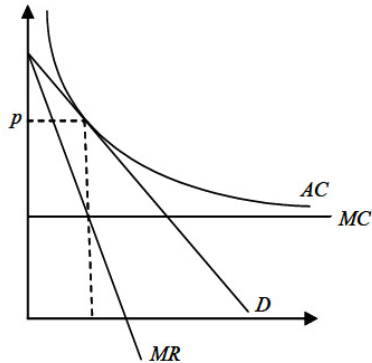
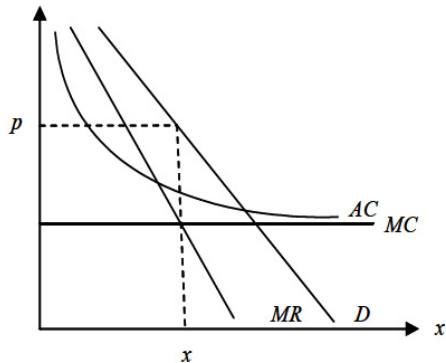
Monopolistic competition: Free entry

With internal economies of scale there cannot be perfect competition. Chamberlain (1933) introduced the notion of monopolistic competition as a market structure.

► Characteristics:

- Every firm has some **market power** and it faces a downward sloping demand curve.
- There is a large number of firms so that a price change by a single firm has no effect on the level of demand faced by the other firms (no strategic interaction).
- With product differentiation a firm has an incentive to differentiate its brand.
- There is free entry so that firms **profits are driven down to zero** (the large group case). The free entry condition (profits are 0) is the standard model's closure.

Monopolistic competition: Free entry and zero profits



Find the mistake!

Part II

Monopolistic competition: Preferences

Dixit-Stiglitz Preferences

$$U = C_M; \quad C_M = \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}; \quad \sigma > 1$$

- N number of available varieties
- c_i consumption of variety i
- σ elasticity of substitution between varieties :

$$\frac{\partial c_j / c_{j'}}{\partial p_{j'} / p_j}$$

Higher when goods become more substitutable

- Remark: In terms of a continuum of varieties:

$$C_M = \left(\int_{i=0}^N c_i^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$$

Indirect utility function

- Indirect utility function: Maximal utility when faced with a price level p and an amount of income w . Represents the consumer's preferences over market conditions. A consumer's indirect utility $V(p, w)$ can be computed from its utility function $U(c)$ by first computing the most preferred bundle $c(p, w)$ by solving the utility maximization problem; and second, computing the utility $U(c(p, w))$ the consumer derives from that bundle.

$$V = \frac{E}{P_M}$$

- P_M is the “ideal” price index associated with the Dixit-Stiglitz preferences:

$$P_M = \left[\sum_{i=1}^N p_i^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$$

Optimal consumption

$$\mathcal{L} = \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} + \lambda \left[P_M C_M - \sum_{i=1}^N p_i c_i \right]$$

⇒ First-order conditions:

$$c_j^{-1/\sigma} \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}-1} = \lambda p_j, \quad \forall j \in [1, N]$$

$$\lambda \left[P_M C_M - \sum_{i=1}^N p_i c_i \right] = 0$$

⇒ Inverse and direct demand curves:

$$c_i = \left(\frac{p_i}{P_M} \right)^{-\sigma} \frac{E}{P_M}, \quad p_i = \frac{c_i^{-1/\sigma}}{\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}}} E$$

Love-for-Variety

- The same level of expenditure spread over more varieties increases utility
- If prices are homogeneous across goods:

$$U = N^{\frac{1}{\sigma-1}} \frac{E}{p}$$

increases with N

⇒ Consumers love variety for variety's sake

Price setting under Bertrand competition

- Maximization program:

$$\begin{cases} \max_{p_j} [p_j c_j - w a_m c_j] \\ \text{s.t. } c_j = \frac{p_j^{-\sigma}}{\sum_{i=1}^N p_i^{1-\sigma}} E \end{cases}$$

⇒ Optimal price:

$$p_j \left(1 - \frac{1}{\sigma - (\sigma - 1)s_j} \right) = a_m w$$

where $s_j = \frac{p_j c_j}{E}$ is the firm's market share

- ⇒ The perceived elasticity ($\varepsilon = \sigma - (\sigma - 1)s_j$) falls as s_j rises
- ⇒ As long as s is not zero, the degree of competition does affect pricing behaviour.

Price setting under Cournot competition

- Maximization program:

$$\begin{cases} \max_{c_j} [p_j c_j - w a_m c_j] \\ \text{s.t.} \quad p_j = \frac{c_j^{-1/\sigma}}{\sum_{i=1}^N c_i^{1-1/\sigma}} E \end{cases}$$

⇒ Optimal price:

$$p_j \left[1 - \frac{1}{\sigma} - \left(1 - \frac{1}{\sigma} \right) s_j \right] = a_m w$$

where $s_j = \frac{p_j c_j}{E}$ is the firm's market share

- ⇒ The perceived elasticity (defined by $1/\varepsilon = \frac{1}{\sigma} + \left(1 - \frac{1}{\sigma} \right) s_j$) falls as s_j rises
- ⇒ As long as s is not zero, the degree of competition does affect pricing behaviour.

Price setting under monopolistic competition

- Under monopolistic competition, each firm has a negligible share of the market ($s_j \rightarrow 0$)
- The perceived elasticity equals σ and the mark-up is constant : $\frac{\sigma}{\sigma-1}$
- Equilibrium pricing does not depend upon the typical firm's conjecture about other firms' reaction (Bertrand and Cournot conjectures produce the same result) $\Rightarrow$ Rules out pro-competitive effects
- In the discrete version, one must assume that N is large. With a continuum of varieties, s_j is automatically zero.
- The invariance of the mark-up implies mill-pricing (ex2): the firm charged the same price "at the mill" or at the factory gate, whatever the extent of shipping costs

Invariance of Firm Scale

- A fixed mark-up of price over marginal cost implies a fixed operating profit margin:

$$pq - cq = \frac{cq}{\sigma - 1}$$

- ⇒ Under fixed production costs, there is a unique level of sales that allows the typical firm to just break down (ie earn a level of operating profit sufficient to cover fixed costs):

$$q = \frac{F(\sigma - 1)}{c}$$

Scale economies, Product differentiation and the Pattern of Trade (Krugman, 1980)

Motivation

- “Standard” models explain trade as a way to increase aggregate surplus through specialization according to comparative advantage
 - ⇒ Unable to explain intra-industry trade
 - ⇒ No role for demand in driving international trade
- “New Trade Theory” explains international trade on differentiated varieties
- Ingredients: Increasing returns to scale, imperfect competition and international trade costs

Hypotheses

- Two regions of size L and L^*
- Two sectors: Agriculture (perfectly competitive, no trade costs) and Manufacturing (IRS, monopolistic competition, costly trade)

$$U = C_M^\mu C_A^{1-\mu}, \quad 0 < \mu < 1$$

- Dixit-Stiglitz preferences over differentiated varieties

$$C_M = \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \quad \sigma > 1$$

- Agricultural technology: $Y_A = L_A$
- Manufacturing technology: $l_i = \alpha + \beta x_i$ (Increasing returns to scale)
- Free entry

Closed economy

- Market-clearing conditions:

$$x_i = Lc_i$$

$$L_A = LC_A$$

$$L = \sum_{i=1}^N (\alpha + \beta x_i) + L_A$$

- Sectoral consumptions:

$$\begin{cases} \max_{C_A, C_M} C_M^\mu C_A^{1-\mu} \\ \text{s.t.} \quad P_A C_A + P_M C_M \leq PC \end{cases}$$

$$\Rightarrow P_M C_M = \mu PC = \mu w$$

$$P_A C_A = (1 - \mu) PC = (1 - \mu) w$$

$$P = \frac{P_A^{1-\mu} P_M^\mu}{(1 - \mu)^{1-\mu} \mu^\mu}$$

Closed economy (2)

- Optimal consumption on each variety:

$$\begin{cases} \max_{c_i} C_M = \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \\ \text{s.t.} \quad \sum_{i=1}^N p_i c_i \leq P_M C_M \end{cases}$$

$$\Rightarrow c_i = \left(\frac{p_i}{P_M} \right)^{-\sigma} C_M = \left(\frac{p_i}{P} \right)^{-\sigma} \frac{\mu PC}{P_M}$$

$$P_M = \left[\sum_{i=1}^N p_i^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$$

Closed economy (3)

- Optimal price in agriculture:

$$P_A = w = 1$$

- Optimal prices in manufacturing:

$$\begin{cases} \pi_i = p_i c_i L - w(\alpha + \beta L c_i) \\ \text{s.t. } c_i = \left(\frac{p_i}{P_M} \right)^{-\sigma} \frac{w}{P_M} \end{cases}$$

⇒ Mill-pricing:

$$p_i = \frac{\sigma}{\sigma - 1} \beta$$

Closed economy (4)

- Free entry:

$$\begin{aligned}\pi_i &= p_i x_i - (\alpha + \beta x_i) = 0 \\ \Rightarrow x_i &= \frac{\alpha}{\beta}(\sigma - 1)\end{aligned}$$

⇒ There is a unique level of sales that allows the typical firm to just break even, ie to earn a level of operating profit sufficient to cover fixed costs.

- Full-employment:

$$\begin{aligned}L &= \sum_{i=1}^N (\alpha + \beta x_i) + L_A \\ \Leftrightarrow N &= \frac{\mu L}{\alpha \sigma}\end{aligned}$$

Costly trade

- Trade increases the diversity of varieties available for consumption:

$$U = \left(\sum_{i=1}^N c_i^{\frac{\sigma-1}{\sigma}} + \sum_{i^*=1}^{N^*} c_{i^*}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \quad \sigma > 1$$

⇒ Positive welfare effect

- Trade is perfectly free in the homogeneous good sector ⇒ Law of one price $P_A = P_A^* \Rightarrow$ Equal wages: $w = w^*$
- “Iceberg” trade costs τ in the manufacturing sector

Costly trade (2)

⇒ Mill-pricing and full pass-through:

$$\left\{ \begin{array}{l} \max_{p_i, p_i^*} [p_i L c_i + p_i^* L^* c_i^* - \beta(L c_i + \tau L^* c_i^*) - \alpha] \\ \text{s.t.} \quad c_i = \left(\frac{p_i}{P_M} \right)^{-\sigma} \frac{w}{P_M} \\ \quad \quad c_i^* = \left(\frac{p_i^*}{P_M^*} \right)^{-\sigma} \frac{w^*}{P_M^*} \end{array} \right.$$

⇒ Optimal prices:

$$\begin{aligned} p_i &= \frac{\sigma}{\sigma - 1} \beta \\ p_i^* &= \frac{\sigma}{\sigma - 1} \beta \tau = \tau p_i \end{aligned}$$

⇒ Price indices:

$$\frac{P_M}{P_M^*} = \left[\frac{N/N^* + \tau^{1-\sigma}}{N/N^* \tau^{1-\sigma} + 1} \right]^{\frac{1}{1-\sigma}}$$

⇒ The relative price of manufacturing goods is a decreasing function of the relative number of firms located in the market.

Costly trade (3)

- Spatial equilibrium equalizing profits:

$$p_i c_i L + \tau p_i c_i^* L^* - w(\alpha + \beta c_i L + \tau \beta c_i^* L^*) = p_i^* c_i^* L^* + \tau p_i^* c_i^* L - w^*(\alpha + \beta c_i^* L^* + \tau \beta c_i^* L)$$

$$\Leftrightarrow s_n = \frac{s_L - \tau^{1-\sigma}(1 - s_L)}{1 - \tau^{1-\sigma}}$$

with $s_n = \frac{N}{N+N^*}$ and $s_L = \frac{L}{L+L^*}$

⇒ Home Market Effect:

$$\frac{ds_n}{ds_L} = \frac{1 + \tau^{1-\sigma}}{1 - \tau^{1-\sigma}} > 1$$

An increase in the relative size of the domestic market more than proportionally increases the relative share of firms located here.

Costly trade (4)

- Note that when wages are endogenous as in Krugman (1980) (no agricultural sector), the relative wage is sensitive to the relative size of countries $\Rightarrow$ Home Market Effect on wages: Large countries have relatively higher wages $\Rightarrow$ The size differential is offset by a wage differential which explains that, in general, agglomeration is not total.
- Consequence of the HME: In a world of IRS, countries will tend to export those kinds of products for which they have relatively large domestic demand.