Monopolistic Competition when Income Matters

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- It is also useful to study Cournot competition with product differentiation.

Background

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- Direct additivity implies that the Marginal Rate of Substitution $u\left(x_i\right) / u\left(x_j\right)$ between any two varieties does not depend on the consumption of other varieties x_k.
- Most applications focus on CES preferences with $\theta \in (1, \infty)$:

$$U = \sum_{j=1}^{n} x_j^{\frac{\theta-1}{\theta}}$$

Monopolistic competition à la Dixit-Stiglitz

- Equilibrium in the CES case:

$$p = \frac{\theta c}{\theta - 1}, \quad n = \frac{EL}{\theta F}, \qquad q = \frac{(\theta - 1)\, F}{c}$$

where p = price, n = number of firms and $q = xL$ = firm production, E = income, L = population, c = marginal cost and F = fixed cost. A double marke size (number of consumers) generates double number of goods, with same price (and quantity per firm), but only with CES. Income does not affect price and quantity, not just with CES

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- General case (Zhelobodko *et al.*, 2012, E.; Bertoletti-Epifani, 2012; Bertoletti-Etro, 2014, Econ. Bulletin):

$$p = \frac{\theta(x) c}{\theta(x) - 1}, \quad n = \frac{EL}{\theta(x) F}, \qquad q = \frac{(\theta(x) - 1) F}{c}$$

  where $\theta(x) = -u'(x)/xu''(x)$.

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- With Cournot or Bertrand competition and CES, an additional competition effect for trade (Etro, 2013, Scand.J.E.) and RBC (Etro-Colciago, 2010, Econ.Journ.)

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- By Hicks (1969) and Samuelson (1969) we know that direct additivity and indirect additivity represent two distinct classes of well-behaved preferences with only one case in common: CES.

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$$x_i = \frac{\partial V / \partial p_i}{-\partial V / \partial E} = \frac{v^{'}\left(\frac{p_i}{E}\right)}{\sum v'\left(\frac{p_j}{E}\right)\frac{p_j}{E}}$$

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- Market demand is given by $q_i = x_i L$ where L is number of consumers (marke size)

Some examples of direct demands

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- EXPONENTIAL: $v(p) = e^{-\tau p}$ delivers log-linear demand:

$$q_i = \frac{e^{-\frac{\tau p_i}{E}} EL}{\sum e^{-\frac{\tau p_j}{E}} \cdot p_j}$$

(notice the difference from the Logit, which has no income effects)

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- ADDILOG: $v(p) = (a - p)^{1+\gamma}$ delivers the linear perceived demand when $\gamma = 1$:

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- DISPLACED CES: $v(p) = (p+b)^{1-\vartheta}$ delivers:

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  where $c > 0$ and $F > 0$ are respectively marginal and fixed costs.
- The demand elasticity is $\theta(p_i/E) \equiv -\frac{v'' p_i}{v' E} > 0$: it depends on p_i/E, not on μ and L.

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- However, if $\theta' > (<)\ 0$, the optimal price grows (decreases) with income because firms face a more (less) rigid demand.
- Rationale for *procyclical markups* in macro, for *pricing to market* in trade

Endogenous Entry Equilibrium

- Dual:

$$\frac{p^e - c}{p^e} = \frac{1}{\theta\left(\frac{p^e}{E}\right)}, \quad n^e = \frac{EL}{F\theta\left(\frac{p^e}{E}\right)}, \quad q^e = F\frac{\theta\left(\frac{p^e}{E}\right) - 1}{c}$$

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- Notice that

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- Other results (pricing to market and undershifting):

$$\epsilon_{pE} \gtrless 0 \text{ and } \epsilon_{nE} \gtrless 1 \text{ iff } \theta'(p^e/E) \gtrless 0$$

$$\epsilon_{pc} \lessgtr 1 \text{ and } \epsilon_{nc} \lessgtr 0 \text{ iff } \theta'(p^e/E) \gtrless 0$$

Two new examples with closed form solutions

- The (negative) exponential demand $q_i = e^{-\frac{\tau p_i}{E}} L/\mu$ delivers:

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- Excess entry arises if and only if $\eta' > 0$, as in the exponential and linear examples (CES delivers the optimal equilibrium)

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- $n^B > n^e$ and thus excess entry is more likely in Bertrand than in monopolistic competition. The competitive effect of L is restored.

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- This is neutral on consumer welfare with CES preferences (Etro, 2008; Anderson *et al.*, 2012), but raises (decreases) consumers welfare if $\eta' > (<) \ 0$.
- Applications to competition policy: *vertical contracts* with low wholesale price below the marginal cost, *bundling* to strengthen price competition in the secondary market, other *incentive contracts* increase CS with $\eta' > 0$, *mergers* to increase prices reduce CS with $\eta' > 0$

Extensions and applications

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- The first best requires marginal cost pricing.

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- a) market size is neutral
  b) if $\theta' > 0$, a change of the distribution according to the *likelihood-ratio dominance* raises prices and number of firms more than with respect to the increase of the average income
  c) a *mean preserving spread* of the income distribution decreases (raises) prices and the mass of active firms if the demand elasticity is convex (concave) in the price.

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- Condition for endogenous entry:

$$\int_{\underline{c}}^{\hat{c}} [\pi_v(c) - F] \, dG(c) = F_e$$

- market size is neutral but higher income increases all prices and makes less productive firms able to survive (an anti-selection effect) if $\theta' > 0$

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1. *Two-country model* à la Krugman (assume $\theta' > 0$)
   First case: no transport costs, different countries

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- richer countries trade between themselves more than poorer countries

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1. *New-Keynesian macroeconomics* à la Blanchard-Kyotaki: nominal rigidities are amplified with Bertrand competition

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3. *Generalized EMS* under any symmetric non-separable preferences

Conclusions

- The dual assumption of *Indirect Additivity* introduces a new setting into monopolistic competition.
  Its results generalize properties of the CES case concerning the impact of the market size.
  The neutrality of income disappears and a rationale for pricing to market emerges.
  New simple models of price competition with and without free entry can be derived from indirectly additive preferences (*exponential and linear demand*).