

A Monopolistic Competition Economic Model of the Horticultural Industry with a Risk of Harmful Plant Invasion

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Analysis applying monopolistic competition model

- Consumers' utility increasing in nursery good variety
- Monopolistic competition in nursery good production (#nurseries $n = \#$ varieties)
- Prob. of biological invasion increasing in n
- Contrast #nurseries:
 1. Market eq'm n^p ;
 2. Optimum w/o invasion damages n^s ;
 3. Optimum given damages n^* .
- Simulation using US and Canadian data

Why market eq'm diverges from the social optimum

In the long run,

- Deadweight loss due to monopolistic competition
($n^p < n^s$?)
- Negative externality due to possible biological invasion
($n^* < n^s$)

Q. Does n^p exceed n^* in the steady state?

Along transition,

- n^p and n^s change due to entries/exits (data suggests entries due to positive profits)
- n^* changes because of changes in A (area invaded) upon invasion

Q. Can # nurseries be compared along transitions?

Technical questions

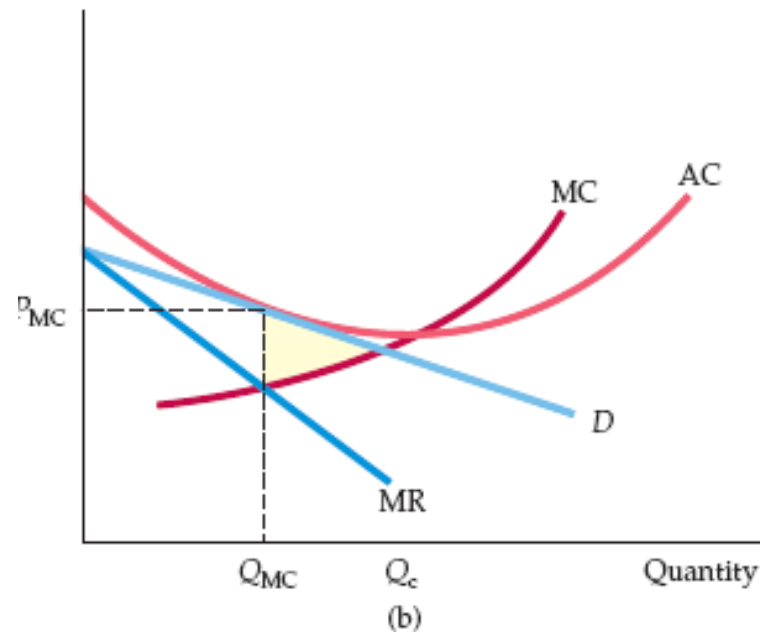
- For simulation, the aggregate industry profit function is specified as eqn (41):

$$\Pi(n) = B(n^p - n)n, \quad B = r \frac{1-\gamma}{\gamma}$$

- The scaling parameter r —how is it pinned down?
- Can Π be derived from assumptions on technology?

On function Π

- Can get it from assumptions on primitives?
(either by $\max U$ or by a partial eq'm analysis)



Parameter values for US and Canada simulations

- Estimated gamma are quite different in US and Canada—intuitions?
- How would landscape / concentration of nurseries factor in?
- Dynamics of invaded areas upon invasion

$$\dot{A} = rA \left(1 - \frac{A}{K} \right)$$

- Are r and K the same for US and Canada?

Sensitivity analysis

- Key parameters: gamma, fixed cost of nursery operations, ...
 - Any fixed-cost component other than full-time labor?
- How do the optimal #nurseries depend on them? Is the sign unambiguous? If so, stating them might be useful

Placing bounds on optimal #nurseries

- Would be useful to know what the reasonable upper or lower bounds are
- Factors implying under-estimate?
 - Control of invasives / containment after establishment? (reducing dA/dt)
- Factors implying over-estimate?

Among others, the strengths are:

- Theoretical model: an innovative and sensible way to describe how nurseries production causes biological invasion, and how to compare eq'm and the first best
- Simulations: combined use of nurseries market data and hazard model estimates based on species observations