Notes on Park Pricing

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- Remark 1. When the price of one park changes, do the prices of other parks in the same country change? If so, historical data will have limited value. Need to check.
- Remark 2. The quality of our econometric results depends on the number of relative price changes. Need to check.

- What is the plan?

(i) use actual attendance data?

(ii) Use travel cost and/or stated preference data?

(iii) Both of the above

- Question 2. Will this study separately estimate the demand function for different quality safaris?

- Assumes only non-resident visitors
- Concentrates on one park
  - Expanding is straightforward but think in survey design about complements

- Model 1- An estimate of the demand function for park services as well as for lodging services

- Model 2. The Revised Double Mark-up
- Think automobiles
- It is set up as a Stackleberg leader game in a monopoly model, where the lodge owner is the follower

The inverse demand function, known by both the lodge owner and the park authority is

(1) $P = f(Q)$

P = the price for both the park services and the lodge's services.

Q = the daily per person quantity demanded. Think of the number of bed nights and the number of park visitor days as identical.

A.3 Assume the park has no costs.

The lodge cost function is $C(Q)$.

Imagine the park authority will levy a tax (t) per person day on the lodge owner.

Assuming (A.4) the lodge owner is the follower, its best response to any tax is determined by maximizing net profit, (Here I (A.5) am assuming away time which again I think is not difficult to relax-just add summation signs),

(2) $\pi^L(Q)= TR(Q)-TC(Q) - tQ$,

where $TR(Q) = Qf(Q)$.

The first order condition is

(3) $f(Q) + Qf'(Q) - C'(Q) - t = 0$.

Or rewriting

$t = MR(Q) – MC(Q)$,

where $MR(Q)$ = marginal revenue and $MC(Q)$ = marginal cost.

From (3),

$Q^* = g(t)$

is the lodge's best response for any give tax or charge (t).

- The principal, the park agency, is the leader and maximizes tax revenues, t(gt), subject to (4) By substitution,

(5) $\Pi^A = tg(t)$

The Agency's first order condition is

(6) $g(t) + tg'(t) = 0$,

so (6) solves for $t = t^*$; (4) then solves for Q^* and (1) solves for P^*.

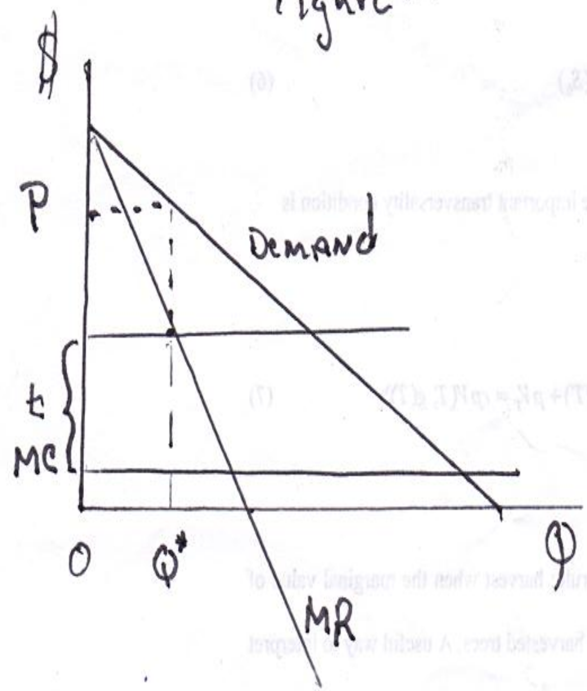
Note the unsurprising result, that from (6),where ε is the elasticity of the tax revenue function,

$$(7)\ \varepsilon = -g' t/g$$

then from (6), tax revenues are maximized for the t such that $\varepsilon = 1$.

- Implicitly, in this analysis is the assumption that non-African consumers’ surplus have a welfare weight of zero.
- Visually, Figures 1.1 and 1.2 reproduce the solution above.

Figure 1.1



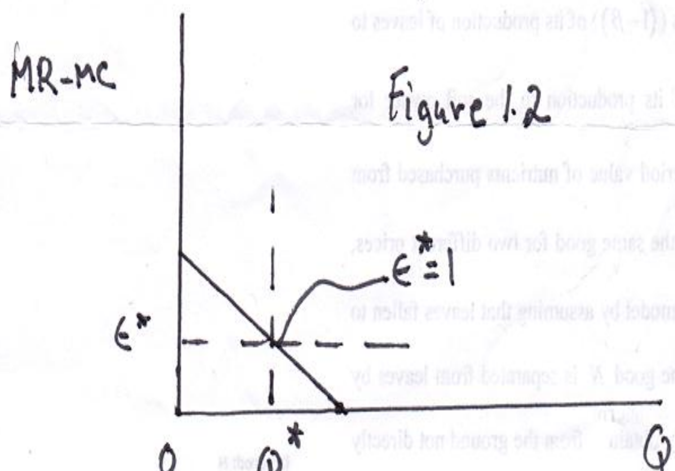


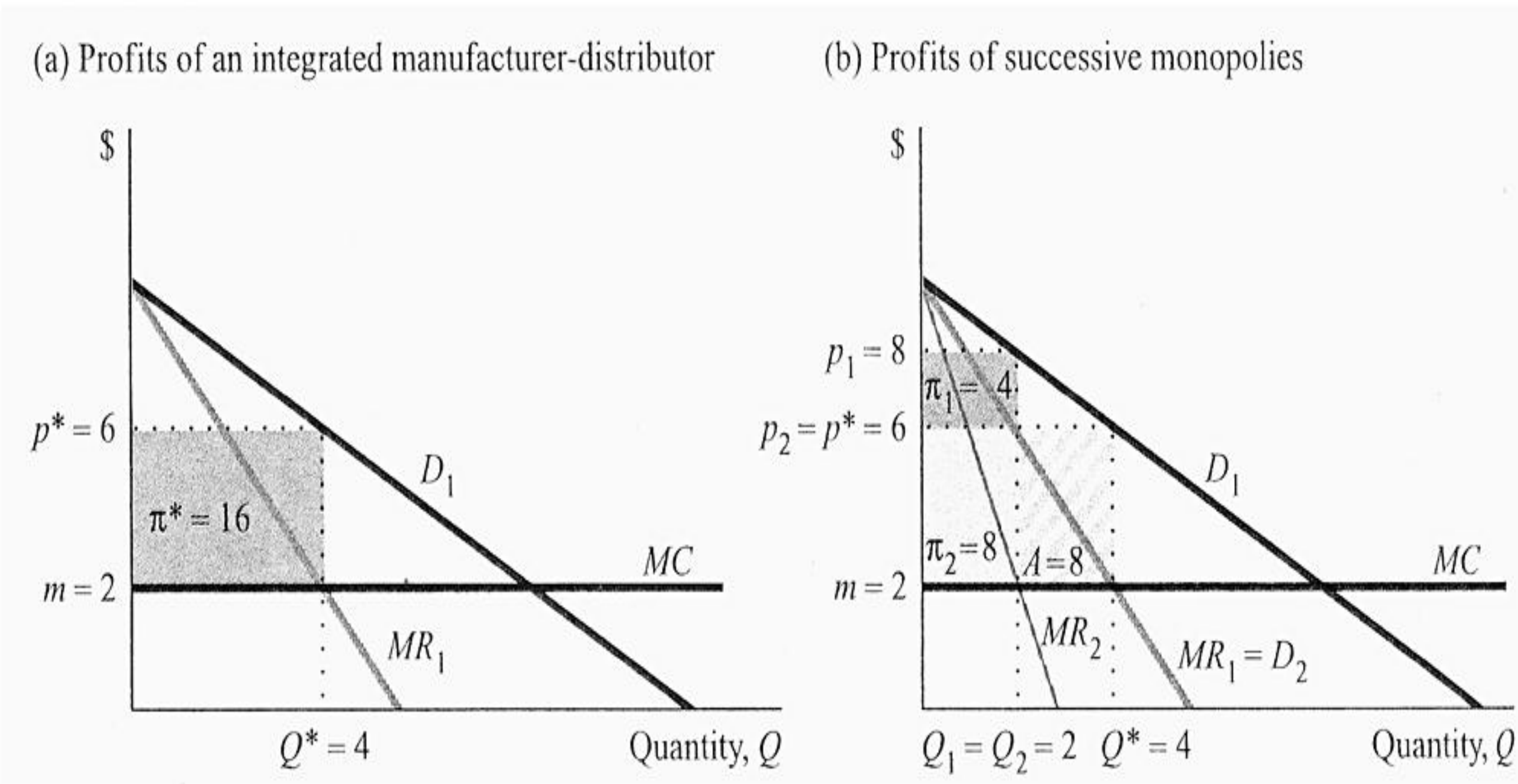
Figure 1.2

- Since the model starts by setting the lodge owners profit maximization problem first, it might look like the lodges are charging the unit park entry fee P while the park authorities collect the tax from the concessionaire. In fact, that is precisely what occurs for most of the visitors who stay in lodges. They pay for a package tour of which the park entry fee is one component.
- In summary, the park manager sets t, the lodge chooses Q and the park authority charges an entry fee, $f = P – t – MC(Q^*)$.

Liberty said that the concessionaires have political power and the model reflects this view.

- Cooperation
- If the lodge owner and the park authority can agree on profit shares, overall profit increases so that both parties gain.
- Joint profit increases because more of the foreigners' consumer surplus is extracted through cooperation. See Figure 2(a), scanned in from a textbook (Carlton and Perloff). The inverse demand function is $p = 10 – Q$. The cost function is $C(Q) = 2Q$.
- The double mark-up scenario produces three-fourths of the profit that cooperation (an "integrated manufacturer distributor") achieves in this concrete example.

Figure 2. Monopolies in both manufacturing and distributing



- The Park authority as the leader

  Many lodges in or around most parks

    - The larger the number of competitors the smaller the bargaining power of each.
    - In the limit, after earning normal profit, $MR(Q^*) = MC(Q^*)$ and all the profit goes to the park authority

- Ecological constraints

  It is easy to add in limits on visitation size, at least analytically
- Critically important

  In the above model, lodging costs are necessary to obtain
- Who is our client?

    Maybe many

    Limited to park authorities?

      Increasing price, decreases quantity and probably reduces tourist expenditures outside the park

- More complexity-Liberty’s view

1. A park manager auctions off a site license for 5 years.
2. They negotiate the annual fee with the winner. Depends on
   - Beds
   - Occupancy rate
   - Expected accommodation price
   - Type of park
3. After 5 years they negotiate the two forms of payment again.

- Model 3-Two part pricing
- Start with an auction
    - Assume lodge operators differ in their marginal cost functions (demand is the same for a given quality)
    - Two lodge players, i and j
-

Player i has a lower marginal cost function than player j, $c_i < c_{j.}$ Player j's profit function is

(8) $\pi_j(Q_j) = TR(Q_j) – TC(Q_j) - tQ_j - A_j$

where A_j is the auction bid by player j.

- The auction is an unrepeated event and since it takes place before the unit tax is declared, player j has to form an expectation of t. How much will j bid? I will assume j bids the pure profit; i.e.,

(9) $TR(Q_j) – TC(Q_j) –tQ_j - A_j = 0.$

Again,

(10) $Q_j = g(t)$.

- For any t, there's an optimal Q_j and A_j. Let's hope it is an open auction and player j doesn't want to punish player i by making a bid player j could not pay for in order to hurt player i.

- Player i observes player j's bid and wins the auction by bidding an insignificant ε more, bidding and paying the lump sum player j would have paid. Player i's profit function is

(11) $\pi_i(Q_i) = TR(Q_i) – TC(Q_i\ )\ tQ_i\ \ -A_j$.

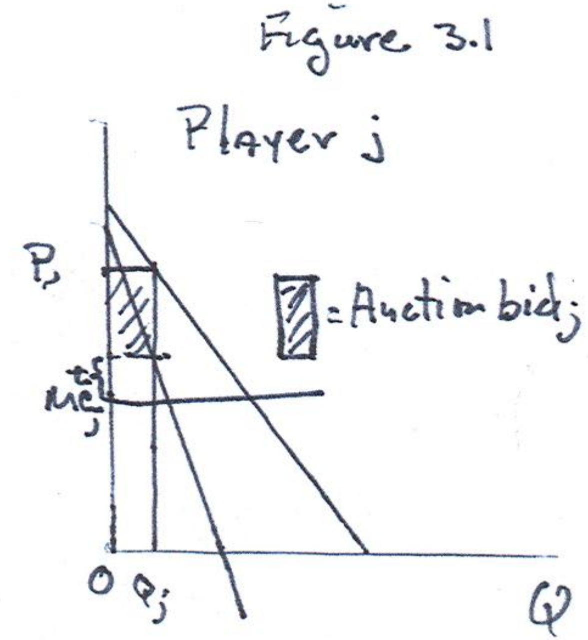
- From the first order conditions, player i's most profitable Q_i given the agency's t, as previously, is

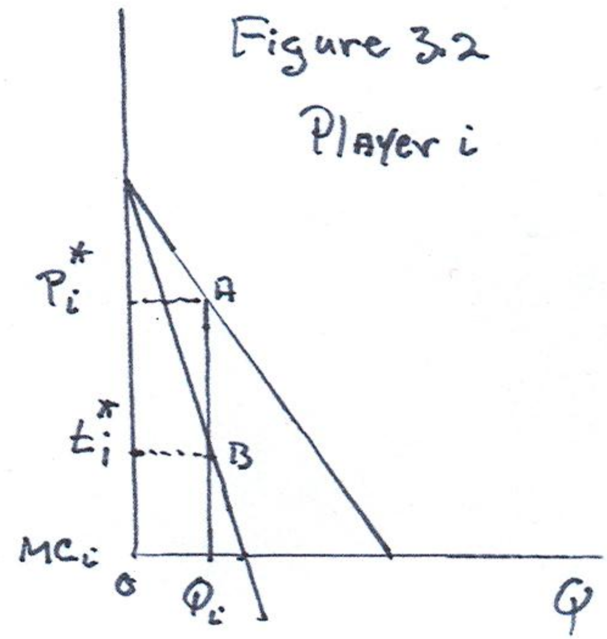
(12) $Q_i^* = g(t_i^*)$.

- Model 3 is just a variation of Model 2 except the winning lodge operator's profits are reduced by its winning bid of A_j. That is, the optimal tax is computed from (5) and (6).
- The Agency chooses t_i* and the lodge operator uses (12) to solve for Q_i* and the demand function solves for P.

- Figures 3.1 and 3.2 illustrate Model 3 where I assume the marginal cost of lodge operator i, $MC(Q_i) = 0$ for a clearer figure.
- Since the winner obtains a contract for N (5) years, the auction payment, in fact, is something like $A_j\theta^t$, where $\theta = (1 + r)^{-1}$, r = the interest rate and the sum is over days and years.

- I add “something” to account for ideas that there might be growth in demand over time and that would affect the size of the lump sum payment.

- 



Player i bids Auction bid$_j$ + ε and wins;
Pays t_i* per unit Q_i *,

Entry fee is f = P* - t_i* - MC(Q_i*).
Player i makes profit P_i*ABt_i* -Auction bid$_j$.

- Conclusion /Questions
- I am bothered by the timing in this problem. You first have to win an auction and then you have to negotiate over the unit tax rate.
- It is not a repeated game - unless negotiating every 5 years can be considered repeatedly.
- How would you introduce expectations?
  - I have assumed “rational expectations” in the sense that the lodge operators guess correctly what the park managers will do. What if the lodge operators were risk averse? The more accurate information they are given, the more they will bid. As of now in the real world, the lodge operators have a distribution about the tax (t) the park managers will charge after the auction is over. Then it seems to me that the park managers would be better off by giving some information to the bidders before the auction takes place.

- Different quality resorts.
- What level of detail does this park pricing project wants to tackle?
- This issue returns to the concerns I have about “stemming from/induced by benefits”
- Do higher quality safaris lead to more or less expenditures/value added/profits both inside and outside the park?
- In Model 3, I have the lowest marginal cost concessionaire winning. If that is the lowest quality operator, is that optimal?
- So does the survey have to be carefully designed to differentiate among qualities of safaris? Budget , sample size and questions asked have to be in order.

References

D. Carlton and J. Perloff, Modern Industrial Organization, 4th ed., Addison Wesley.

Walter Oi (1971) “Two-part Tariffs for a Mickey Mouse Monopoly,” QJE, 85 (1), 77-96.