Errata to the 3rd Printing of Industrial Organization: Theory & Applications

by

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December 17, 2007

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Catalog-page : http://mitpress.mit.edu/book-home.tcl?isbn=0262691795

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Chapter 2: Basic Concepts In Noncooperative Game Theory

p.32, line 9, ...that no unilateral [deviation] is beneficial...

p.32, line -9: replace "rate of time preference" with "time discount factor"

p.32, line -8,-7: replace "...when players have a low rate of time preference" with "...when players have a low discount factor"

p.33, line 4: replace "higher rate of time preference" with "higher discount factor"

p.33, line 13: replace "sufficiently large rate of time preference" with "sufficiently large discount factor"

p.41, Exercise 5: typo: How many subgames are THERE in this...

Chapter 3: Technology, Production, Cost, And Demand

p.48, Figure 3.2: The AC curve (bottom row) is drawn under the assumption that $0 < \gamma < 1/2$. Observe that when $\gamma = 1/2, AC = WQ$ constituting a ray from the origin. When $1/2 < \gamma < 1$, AC is concave to the origin (rather then convex).

p.52, top equation: there is no reason why switching from the "d" operator to the partial derivative operator.

p.54, Fig.3.6: $CS(p)$ should be $CS^0(p)$

p.54, eq.(3.7), last term should be $= U(Q^0, I - p^0) - I$.

Chapter 5: The Monopoly

p.94, 7(b): Inverse-demand should be corrected to $p = Q^{-1/2}$

Chapter 6: Markets For Homogeneous Products

p.99, bottom displayed equation: superscript C can be removed.

p.109, Proposition 6.2(2): This equilibrium is NOT unique since $p_1 = c_2$ and $p_2 = c_2 + \epsilon$ is also an equilibrium.

p.109, Proposition 6.2(2): The condition should be

$$(c_2 - \epsilon - c_1)\frac{a - c_2 + \epsilon}{b} > (c_2 - c_1)\frac{a - c_2}{2b}$$

p.109, Proposition 6.2(2): It is useful to assume that $\lambda \geq 2$ (instead of $\lambda \geq 1$). Under $\lambda = 1$, undercutting by firm 1 may leave it with zero profit.

p.111, line -14: Consumer 3 a maximum of \$1 (instead of \$2)

p.111, line -6: Assume that each firm is limited to producing at most 2 units (instead of 1). The reason is that if each firm has a capacity of 1, then $p_1 = p_2$ is a Nash-Bertrand equilibrium.

p.115, line 5: Replace Definition 2.4 by Definition 6.1

p.115, line 6: replace $p_1^c = p_2^c = 3$ by $q_1^c = q_2^c = 3$

p.118, line 4: replace $t = 0, 1, 2, ...$ by $t = 1, 2, ...$

p.128, line -6: "...to enter or the exit..." should be: "...to enter or to exit..."

Chapter 7: Markets For Differentiated Products

p.136, eq.(7.2): delete > 0 after the "c" (that is, we allow $c < 0$ at this stage)

p.143, equation (7.12): From a technical point of view only, it is more appropriate to write it as: $\sum_{i=1}^{N} q_i^{1/2}$, where N is the number of produced brands

p.144, equation (7.13) should be:

$$\sum_{i=1}^{N} p_i q_i \leq I \equiv L + \sum_{i=1}^{N} \pi_i(q_i).$$

p.144, the last line: The minus sign in front of λ on the RHS of the Lagrangian should be be replaced by the plus sign.

p.145, (7.14) should be:

$$p_i(q_i) = \frac{1}{2\lambda\sqrt{q_i}}$$

p.145, line -4: ... $-(F + cq_i)$ [replace $-$ by $+$]

p.150: (Style correction: Not a mistake!) the $()$ around $(L - b + a)$ and $(L + b - a)$ in the last two equations are redundant.

p.151, line -7: Replace "the distance between the firms" with "the transportation cost parameter, τ ."

p.155, Definition 7.4 (2), second line: $\pi_i(q^o) = 0$ should be $\pi_i(p^o, p^o) = 0$.

p.155, last line: τ/N and $1/N$ should be: τ/N^o and $1/N^o$ respectively.

p.157, Fig. 7.9, 3rd line: π_2 should be

$$\pi_2 = 1 - x_2 + \frac{x_2 - x_3}{2}$$

p.160, Line 13: (Style correction: Not a mistake!) replace maintaining by obtaining

p.162, the last term of the last equation: should be $\beta^2 - \gamma^2$ (not α^2)

Chapter 8: Concentration, Mergers And Entry Barriers

p.172, line 9: delete "was a measure"

p.179, 3rd line below Proposition 8.3: "...firm B or firm 1..." should be: "...firm B or firm 2..."

p.182, line 8: ...Nash equilibrium were... should be: ...Nash equilibrium where...

p.183, line -5: increasing returns to scale for low output levels

p.184, line -8: "less than the entry cost" should be: "less the entry cost"

p.185, line 1 of 3rd paragraph: "...this analysis be..." should be: "...this analysis by..."

p.186, Proposition 8.6: (Style correction: Not a mistake!) Add: Formally, ((Exit, Stay-in), Enter) is a unique SPE.

p.189, equation (8.17): replace $-k_1$ by $-\bar{k}_1$.

p.196–197: Equation (8.21) should be:

$$\frac{F}{H} < \rho < \left(\frac{F-L}{H-L}\right)^{\frac{1}{2}} \qquad (8.21)$$

The proof of Proposition 8.8 should be modified:

We look at the equilibrium strategies where firm 1 invests in every t and firm 2 does not invest. First, observe that since firm 1 invests at t and still has capacity at $t+1$, if firm 2 deviates and invests at t, it will earn $L - F$ at t, $L - F$ at $t+1$, and $H - F$ in every period thereafter. Firm

2 will not deviate and invest at t it only if

$$\pi^2 = (1+\rho)(L-F) + \rho^2 \frac{H-F}{1-\rho} < 0, \quad \text{or} \quad \rho^2 < \frac{F-L}{H-L}.$$

Secondly, if firm 1 deviates, i.e., ceases investing at $t-1$, then it has no capacity at t and firm 2 will earn $H-F$ at t. Hence, firm 2 will enter.

Thirdly, if firm 1 stops investing at $t-1$, it will earn a profit of H in period $t-1$ and zero thereafter. Thus, in order for having firm 1 engaging in continuous investment, it must be that

$$H < \frac{H-F}{1-\rho}, \quad \text{or} \quad \rho > \frac{F}{H}.$$

Therefore, the specified strategies form a NE if the modified (8.21) holds. *Q.E.D.*

p.199, Figure 8.9: The curve should be convex to the origin (rather than concave).

p.204, eq. (8.27): replace $q_1^1(4) = 5$ by $q_1^1(4) = 3$

p.210, line -5: However, at a [high] postmerger ...

Chapter 9: Research and Development

p.222, line 12: add) after innovation

p.227, Proposition 9.1 should read:

$$E\pi^S(1) > E\pi^S(2) \text{ but } E\pi_k(2) > 0, \quad \text{when} \quad \alpha(1-\alpha)V < I < \frac{\alpha(2-\alpha)V}{2}.$$

p.230, eq.(9.6) Restrict β to satisfy $(3-\sqrt{7})/2 < \beta < 1$.

Explanation: making $\beta < 1$ would make the own R&D effect stronger than the rival effect. Now, when $\beta < (3-\sqrt{7})/2$, the slope of the best-response functions implicitly defined by the FOC of (9.8) is less than -1, which make the system unstable.

Remark: Using the implicit function theorem, the FOC of (9.8) becomes

$$\frac{2(2\beta^2 - 5\beta + 2)}{2\beta^2 - 8\beta - 1},$$

which is negative for $\beta < 0.5$, and positive for $\beta > 0.5$. Finally, note that the model is unstable when there are no spillovers, i.e., when $\beta = 0$.

p.233, line 12: Shaffer and Salant (1998) instead of (1994)

p.235, line 7: Nordhous should be Nordhaus

p.238, eq.(9.15): The second term after the = sign should be

$$-\frac{(x^I)^2}{2}\frac{1-\rho-\rho^T}{1-\rho} \quad \text{s.t. ...}$$

p.238–239: The Proof of Proposition 9.4 must be divided into 2 cases: First, for $\rho < 0.5$

$$W(1) = \frac{CS_0 + (a-c)^2}{1-\rho} - \frac{(a-c)^2}{2}\frac{(1-2\rho)}{1-\rho} = \frac{CS_0}{1-\rho} + \frac{(a-c)^2}{1-\rho}\frac{(1+2\rho)}{2} \qquad (9.16)$$

$$W(\infty) = \frac{CS_0}{1-\rho} + \frac{(a-c)^2}{(1-\rho)^2} - \frac{(a-c)^2}{2(1-\rho)^2} = \frac{CS_0}{1-\rho} + \frac{(a-c)^2}{2(1-\rho)^2} \qquad (9.17)$$

$$W(1) > W(\infty) \Longleftrightarrow \frac{(a-c)^2}{1-\rho}\frac{1+2\rho}{2} > \frac{(a-c)^2}{2(1-\rho)^2} \Longleftrightarrow \rho < \frac{1}{2} \qquad (9.18)$$

Second, for $\rho \geq 1/2$ we approximate T as a continuous variable. Differentiating (9.15) with respect to T, and equating to zero yields

$$T^* = \ln[3 + \sqrt{(}6 + \rho^2 - 6\rho) - \rho] - \frac{\ln(3)}{\ln(\rho)} < \infty.$$

Instead of verifying the second order condition, it is easier to verify that for $T = 1$,

$$\frac{dW(T)}{dT} = \frac{(a-c)^2\rho(1-5\rho)\ln(\rho)}{2(1-\rho)^2},$$

which is greater than zero for $\rho > 0.2$.

p.239, line 8 & 16: should be Proposition 9.4 (not 9.18)

p.251: Nordhous should be Nordhaus

p.251: Shaffer, G., and S. Salant. 1998. "Optimal Asymmetric Strategies in Research Joint Ventures." International Journal of Industrial Organization 16: 195–208. (updated reference)

Chapter 10: The Economics Of Compatibility And Standards

p.260, line -11: "...the aggregate the number..." should be: "...the aggregate number..."

P.271: The sentence before Proposition 10.13 should be deleted, since it contradicts the statement made about the 3rd equilibrium of the proposition.

Chapter 11: Advertising

p.289, Figure 11.2: The graph of $1/[\delta(1-\delta)]$ should be upward sloping for all $\delta > 0.5$, and slope $+\infty$ at $\delta = 1$.

p.289 (bottom 2 lines) and p.290 (first 2 lines): This discussion should be rewritten since in the specified range firms overadvertise (not underadvertised as stated).

p.294, part 2 of the proof, line 2: Replace $\pi^1(I, P) = N$ by $\pi^1(P, I) = N$.

p.295, line 12, "principle" should be "principal"

Chapter 12: Quality, Durability, And Warranties

p.314, equation (12.8), line 2 should be:

$$\pi_B(a,b) = \frac{1}{b-a}\left[\frac{2(b-a)^2}{3} - \frac{4(b-a)^2}{9} + \frac{2(b-a)^2}{9}\right] = \frac{4(b-a)}{9}.$$

p.316, top line should be: "and who desires..."

p.326, Figure 12.5: There is no reason for assuming that $U^G > N^G/2$. In fact, this assumption may be misleading since it implies that in regions (I) and (II), $p^U > p^N$ (i.e., used cars are priced higher than new cars).

p.330, 1st displayed equation: $p^m q^m$ should be: $(p^m - c - H)q^m$

p.331, line 4: "care or it" should be: "'care of it"

Chapter 13: Pricing Tactics: Two-Part Tariffs And Peak-Load Pricing

p.343, Figure 13.1 the quasi-linear indifference curves are not parallel but they should be parallel.

p.345, Figure 13.2 the quasi-linear indifference curves are not parallel but they should be parallel.

p.346 r-3 (not a typo, just better exposition): $MR_H(Q_H) = MR_B(Q_B) = MC(Q_H + Q_B) = 0$ (same order as on p.77).

Section 13.3: Peak-load pricing: The analysis is conducted under the assumption that low-season demand is "significantly" lower than the high-season demand. This assumption must be added to

Proposition 13.4 on page 350. In future editions, I will add an analysis of peak-load pricing when the two demand functions are similar, in which case capacity should be treated as a "public" good.

p.351, line 2: Replace "determined by is..." by "determined by..."

p.354, line 16: The assumption $c_D \geq c_N$ is not needed. Replace it with $c_D \geq 0$ and $c_N \geq 0$.

p.354, equation (13.11) should be:

$$TC(\hat{\delta}) = r \max\left\{\hat{\delta} - a, b - \hat{\delta}\right\} + (\hat{\delta} - a)c_N + (b - \hat{\delta})c_D. \qquad (13.11)$$

p.354, last line should be: $K = (b-a)/2$ instead of $K = (a+b)/2$.

p.355, Figure 13.6 should be:

$$\frac{(b-a)(r + c_D + c_N)}{2}$$

p.357, Proposition 13.7, the signs of the r should be reversed (twice) so that

1. under vertical differentiation

$$\hat{\delta} = \min\left\{\frac{\beta(1+b) + r + c_D - c_N}{2\beta}; \frac{a+b}{2}\right\}, \quad \text{and}$$

2. under horizontal differentiation

$$\hat{\delta} = \max\left\{\frac{\beta(1+b) - r + c_D - c_N}{2\beta}; \frac{a+b}{2}\right\}.$$

p.358. Proof: the signs of the r should be reversed (twice) so that

$$\beta(1+b) - 2\beta\hat{\delta} = -r + c_N - c_D.$$

$$\beta(1+b) - 2\beta\hat{\delta} = +r + c_N - c_D.$$

Chapter 14: Marketing Tactics: Bundling, Upgrading, And Dealerships

p.364, line -8: "bundling" should be "tying"

p.368, Proposition 14.5 (2) "bundling" should be "tying"

p.369, line -4: Replace "the North America" by "North America"

p.375, Line -6: Replace $\equiv$ by $=$.

p.375, Line -5 should be "... if and only if $w > \frac{1}{2}$. Hence,"

p.375, bottom line should be: "That is, $\bar{s} < s^*$."

p.376, Line 3 should be: "That is, $\bar{s} > s^*$."

p.376, line 8: Replace "...to overtaken" by "...to be overtaken"

p.378–379, the sentence before (14.16) should be: "...we know that a necessary condition (but not sufficient) for a new edition to be introduced in period 2 is"

p.379, equation (14.17) should be:

$$\pi = n(p_1 - c) + \pi_2 = \begin{cases} n(V-c) + n(V-c) - F & \text{if a new edition is introduced} \\ n(V + c - c) + 0 & \text{no revision is made.} \end{cases}$$

p.387, line -5: $p_i^D = B - F$ should be $p_i^D = B$.

p.388, line 6: $[0, 1/2)$ should be: selling in the neighborhood of consumer 1.

p.388, line 7: $[1/2, 1]$ should be: selling in the neighborhood of consumer 2.

Chapter 15: Monitoring, Management, Compensation, And Regulation

p.404 line-16: delete the sentence: "In other words, the contract that $w^H - w^L$ is minimized."

p.411 eq.(15.30) should be:

$$\max_{\alpha_i} \left[-a\alpha_i c + 2a\alpha_j c + 6\alpha_i c^2 - 2\alpha_i^2 c^2 - 3\alpha_j c^2 - \alpha_i \alpha_j c^2 + \alpha_j^2 c^2 \right] \qquad (15.30)$$

however the best-response function is correct.

p.412, eq. (15.34) should be:

$$\max_{\alpha} (\pi_1 + \pi_2) = 2(ac\alpha - 2c^2\alpha^2 + 3\alpha c^2).$$

However, the solution to the maximization of the joint profit is correct.

p.414, line-10: $1/2$ should be $3/4$

p.417, line 5: $S()$ should be s() [lower case]

p.418, eq. (15.41):

$$[p(c^H) - c^H][a - p(c^H)] + s(c^H) \geq 0 \quad \text{and} \quad [p(c^L) - c^L][a - p(c^L)] + s(c^L) \geq 0.$$

Chapter 16: Price Dispersion And Search Theory

p. 424, line 17: "In addition, on average, half of..." should be "In addition, on average, $1/3$ of...".

p.426, top line: Delete "since we assumed that $H > 3L$." That is, $p_D < p_{ND}$ always holds.

p.427, Assumption 16.1: Add: From consumers' point of view, the number of stores of each type is "large." Consequently, from consumers' perspective, the price distribution associated with the next search does not vary during the sequential search process.

p.427, Assumption 16.1 (2): Not an error, but an incomplete assumption, which should be: $0 < s < (n-1)/2$.

p.428, line 9: as long as he or she likes instead of as long as he she likes

p.431, subsection 16.2.2, line 9: Replace "when he or her" with "when he or she"

p.432, delete Exercise 1.

Chapter 17: Miscellaneous Industries

p.444, Proposition 17.2: Replace "increases exponentially" with increases quadratically"

p.445, eq.(17.6): the last term of profit expression should be:

$$-2c\left(\frac{3n}{4c}\right)^2 \text{ instead of } -2\left(\frac{3n}{4c}\right)^2.$$

I.e., c is missing.

p.452, eq.(17.18): The restriction should include: $0 < \alpha < 1$

p.452, last paragraph: Should read: ...measures the driving [time] that [is] independent...

p.454,line before (17.25): Add: Substituting $(N - n_c)$ for n_T, the first-order...

p.455, Figure 17.4: On the horizontal axis, n_C^s should be placed to equal half of n_C^e, and n_C should be n_C^e. Also,

$$\frac{\partial L_C}{\partial n_C} \quad \text{should be} \quad \frac{\partial (n_C L_C)}{\partial n_C}$$

Acknowledgements

I wish to thank a large number of students and faculty members for providing me with many comments and corrections. In particular, I am indebted to:

Ramiro Tovar Landa	(ITAM, Mexico)
Uwe Dulleck	(Humboldt U., Germany)
Masaru Uzawa	(Otaru U. of Commerce, Japan)
William drake	(Duke U., USA)
Sten Nyberg	(Stockholm U., Sweden)
Huizhong Zhou	(Western Michigan, USA)
Abraham Subotnik	(U. of Haifa, Israel)
Sang-Li Lim	(Taejon U., Korea)
Ugo Merlone	(Turin U., Italy)
Joanna Poyago-Theotoky	(U. of Nottingham, England)
Michael Bar	(U. of Haifa, Israel)
Dennis Kundisch	(U. of Augsburg, Germany)
Keiichi Koda	(Yokohama National U., Japan)
Reiko Aoki	(U. of Auckland, New Zealand)
Craig Parsons	(U. of Alaska, Anchorage)
Fernando Barran	(Catholic U. Damaso Antonio Larranaga, Uruguay)
Monica Savecki	(Catholic U. Damaso Antonio Larranaga, Uruguay)
Chiwoong Lee	(U. of Tokyo, Japan)
Jens Krueger	(Friedrich-Schiller U. Jena, Germany)
Adelino Fortunato	(U. of Coimbra, Portugal)
Lu Yuanzhu	(National U. of Singapore)
Yoshikuni Sato	(Osaka U., Japan)
José Sanchez	(Catholic University of Chile)
Maksym Sukhar	(National University "Kyiv-Mohyla Academy," Ukraine)