Errata file for
"Advanced Microeconomic Theory: An Intuitive Approach with Examples," MIT Press

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1. **Chapter 1 - Preferences and utility**

   - Page 7, Example 1.2 (third line). The sentence "An individual states that he prefers alternative x to y if $x \geq y-1$ $(x+1 \geq y)$,.." until "...becomes indifferent between them." should read as follows:
     - "An individual states that he is indifferent between alternatives x and y when they are very close together, specifically, when the absolute value of their difference satisfies $|x-y| < 1$. This means that $-1 < x-y < 1$ or, after rearranging, $y-1 < x < y+1$. Therefore, when alternative x satisfies both $x > y-1$ and $x < y+1$, the individual is indifferent between x and y. Intuitively, when alternatives are relatively similar (i.e., close to $x = y$), the individual cannot tell them apart. However, he strictly prefers x to y when $x \geq y+1$, meaning that alternative x is at least one unit larger than y. In contrast, he strictly prefers alternative y to x when $x \leq y-1$ (or $x+1 \leq y$), which indicates that alternative y is at least one unit larger than x.
       Therefore, this preference relation satisfies completeness since, for a given bundle y, another bundle x lies in the indifferent set (when x satisfies both $x > y-1$ and $x < y+1$), in the upper contour set (when $x \geq y+1$), or in the lower contour set (when $x \leq y-1$).
       Transitivity, however, does not hold, which we can easily prove with the following counterexample. Consider alternatives 1.5, 0.8, and 0.3, where"
   - Page 12. Last paragraph should read "Combining our results in examples 1.5 and 1.6, we can see..."
   - Page 14. The balls in figures 1.3a, 1.3b, and 1.3c should have dashed lines to indicate open balls, not closed balls.
   - Page 15. The ball in figure 1.4 should have dashed lines to indicate an open ball, not a closed ball.
   - Page 16, Figure 1.5. The label of the lower countour set should read $\{y \in \mathbb{R}^2_+ : x \succsim y\}$.
   - Page 17, Figure 1.6, the label at the left bottom corner, $x << z$, should read $z << x$.
   - Page 18. Definition of Convexity 2 (top of the page). Its last line should read "$UCS(x) = \{y \in \mathbb{R}^2_+ : y \succsim x\}$, is convex."
   - Page 20, fifth line. The text refers to figure 1.10b, but it should read "figure 1.9b."
   - Page 22, Table 1.1.
     - The last utility function of the table, $ax_1^2 \times bx_2^2$, should have check signs, ✓, both in the column of convexity and strict convexity.

– Add the following two rows to the table, so it now shows six different utility functions:

$$\begin{array}{lcc} ax_1^{1/2} + bx_2^{1/2} & \checkmark & \checkmark \\ ax_1^2 + bx_2^2 & X & X \end{array}$$

- Page 28.
  - Third line should read "Figure 1.15b, in contrast, represents utility function $v(x_1, x_2) = x_1^{6/4} x_2^{6/4}$. This 3D illustration shows that a given increase in either good 1 or 2 initially yields a small utility increase..." At the end of this paragraph, we should add the following footnote: "As a practice, you can find the Hessian matrix of this utility function, to check if the function is concave or convex. You should find that it is indefinite since the first principal minor is positive (i.e., $\frac{\partial^2 u}{\partial x_1^2} = \frac{3x_2^{3/2}}{4x_1^{1/2}}$) while the second principal minor is negative (i.e., the determinant of the Hessian matrix is $-\frac{9x_1x_2}{2}$). Recall that for a function with two variables to be weakly concave (convex), we need it to be positive (negative) semidefinite, meaning that both of its principal minors must be weakly positive (negative, respectively)."
  - Third paragraph should start "Last, note that the utility function $v(x_1, x_2) = x_1^{6/4} x_2^{6/4}$ is strictly..." In addition, the previous to last sentence in this paragraph should read "Importantly, both utility functions are quasi-concave, although the former is strictly concave while the latter is neither concave nor convex."
- Page 30, footnote 20, should read "located in the horizontal line to the left of bundle $(2, 1)$, contains a strictly larger amount of good 1 but the same amount of good 2, thus satisfying..."
- Page 35, subsection 1.8.3, first line. Term $B > 0$ should read $\beta > 0$.
- Page 42,
  - Add the following displayed relationship after the first paragraph of Section 1.9.3, but before the Proof:

$$\text{Homogeneity} \Rightarrow \text{Homotheticity, but}$$

$$\text{Homogeneity} \not\Leftarrow \text{Homotheticity.}$$

  - Proof at the bottom of the page. Function $v(x_1, x_2) = x_1, x_2$ should not have a comma between x_1 and x_2, so it should read $v(x_1, x_2) = x_1 x_2$.
- Page 52, second displayed equation. The x_i before β_i in the last term of the equation should be deleted so it reads "$\ldots - \beta_i \max\{x_i - x_j, 0\}$,"
- Page 53.
  - First paragraph, ninth line, should read "... with slope $(1-\alpha)/\alpha$ for points below that line, where these slopes satisfy $(1-\beta)/\beta \geq (1-\alpha)/\alpha$ since $\alpha \geq \beta$ by definition. In addition, note that..."
  - Figure 1.29 should have x_j on the vertical axis, and x_i on the horizontal axis.
- Page 54. The second displayed equation should read:

$$u_i\left(x_i, \frac{x_i}{x_i + x_j}\right) = x_i - \alpha\left(\frac{x_i}{x_i + x_j} - \frac{1}{2}\right)^2$$

  could represent individual i's preferences in this context, where $\alpha_i \geq 0$ captures how much individual i cares about relative payoffs, as measured by ratio $\frac{x_i}{x_i + x_j}$."
- Page 55
  - Line 4 should read "that j is well behaved, $\gamma_j = 0$, the utility..."
  - Line 9 should read "...rather than the amount of these goods."
- Page 60, Section 1.14. At the end of the page, after the WARP definition, add "Note that $x \in C(B)$ in the premise of the above definition allows for x to be the only element chosen from set B, or for x to be one of several chosen elements. Examples 1.12 and 1.13 below illustrate these points."

- Page 63, Section 1.15.1, line 6, should read "...of 8 hours, that consumption set would..."
- Page 71, Exercise 9, part (c). Sets X_1 and X_2 should be defined in brackets, as follows $X_1 = \{x_{11}, x_{12}, ..., x_{1n}\}$ and $X_2 = \{x_{21}, x_{22}, ..., x_{2n}\}$.
- Page 72, Exercise 12,
  - Line 4 should read "B and B' in β,".
  - The displayed equation should read

$$C(B) \cap C(B') \neq \varnothing \text{ implies that } C(B) \cap C(B') = C(B \cap B').$$

  - Line 6 should read "set B and when facing set B', $C(B) \cap C(B')$, coincide with..."
  - Line 7, at the end should add a space, so it reads "...to both sets, $B \cap B'$, that is,..."
- Page 73.
  - Exercise 14. There should be $i = 1$ below the multiplication operator, rather than $i - 1$.
  - Exercise 16. The second line should read "...utility function $u(x_1, x_2) = x_1^{\alpha} x_2^{\beta}$, where...
- Page 74. The list of references should add the following:
  - Dr. Seuss. 1961. *The Sneetches and other stories*, Random House. New York.
  - Laibson, D. 1997. Golden eggs and hyperbolic discounting. Quarterly Journal of Economics 112(2): 443-77.
  - O'Donaghue, T. and M. Rabin. 1999. Doing it now or later. American Economic Review 89(1): 103-24.
  - Nicholson, W., and C. Snyder. 2011. *Microeconomic Theory: Basic Principles and Extensions*. Boston: Cengage Publishing.
  - Klibanoff, P., M. Marinacci, and S. Mukerji. 2005. A smooth model of decision making under ambiguity. Econometrica 73(6): 1849-92.

2. **Chapter 2 - Demand Theory**

- Page 83. Second paragraph of subsection 2.1.5. The sentence "At this point, however, the individual...(and we know that monotone utility functions must satisfy LNS)." should read "At this peak, however, the individual cannot find a more preferred bundle, thus violating LNS. Since monotonicity holds, LNS must also hold, preventing this "blissing point" from occuring."
- Page 97, sixth line. There is a v missing in the definition of a set. It should read $\{(p, w) : v(p, w) < v(p^*, w^*)\}$.
- Page 115. Add one space before the paragraph that starts with "Let us now briefly review..." to emphasize that the subsequent discussion talks about a different topic.
- Page 119, Second displayed equation. The last inequality should be replaced with $\geq$ sign, so it reads

$$\frac{\partial L}{\partial x_k} = p_k - \mu \frac{\partial u(x^*)}{\partial x_k} \geq 0$$

- Page 127, Figure 2.41. The horizontal axis should have w/p_1' in the last horizontal intercept, instead of w/p_1.
- Page 129.
  - Line 3 should read "...this property implies that all goods cannot be net complements in consumption (while they can still be all net substitutes). In particular..."
  - Line 6 should read "If all goods were net complements, all the off-diagonal terms would be negative.[1] In this case..."
- Page 131, second paragraph. The sentence "the Walrasian demand is steeper the Hicksian demand." should read "the Walrasian demand is steeper than the Hicksian demand."

[1] Recall that, by the Compensated Law of Demand, self-price effects must be negative, implying that the diagonal terms in the Slutsky equation must be negative. When the negative self-price effect is so strong that compensates all other positive cross-price effects, we can still obtain $D_p h(p, u)p = 0$.

- Pages 135-137. Figures 2.44 to 2.47. Please change to $v\left(p, e(p,u)\right) = u$ at the bottom of each figure.
- Page. 150, Example A2.3. The list of prices should change p_1 and p_2, so they read $p_1 = (1,1,1)$ and $p_2 = (2,1,1)$.
- Page 151, Example A2.4. In the list of prices, please change $p_2 = (2,1,1)$ so it reads $p_2 = (1,2,1)$.
- Page 154, Exercise 4, second line should read "...the price of good i, and..."
- Page 155.
  - Exercise 5, part (c). Third line should read "...the most expensive, $p_1 > p_2$, then the consumer spends all his wealth on good 1, $x_1\left(p_1, p_2, w\right) = \frac{w}{p_1}$, but nothing on good 2, $x_2\left(p_1, p_2, w\right) = 0$. More generally,..."
  - Exercise 6. Second line should read "...and then the student needs to..."
  - Exercise 6. The table that now shows up at the bottom of the page should be centered, and larger. Now it has a smaller font than footnotes.
- Page 156. Exercise 9a should read $p_x = \$0.5$ instead of $p_y = \$1$.
- Page 157.
  - Exercise 9. Last two parts of the exercise (e and f) should be deleted since they ask students to find the CV and EV of a price decrease, which is the topic of chapter 3.
  - Exercise 10, part (b) should read "...that an inferior good does not need to..."
- Page 160.
  - Exercise 21, part (b) should read "...the Walrasian demand functions $x\left(p, w\right)$ obtained in part (a) satisfy...".
  - Exercise 22, second line, the N superscript is shifted. It should read "...utility function $u : \mathbb{R}_+^N \to \mathbb{R}$."
- Page 161, Exercise 27. The end of the question should read "...must satisfy $\varepsilon_{h_i,p_i}\varepsilon_{h_j,p_j} \leq \varepsilon_{h_i,p_j}\varepsilon_{h_j,p_i}$. [*Hint*: Recall that the expenditure function $e(p,u)$ is concave in prices.]"

3. **Chapter 3 - Demand Theory-Applications**

- Page 168. Section 3.1.2. Fourth line should read "...decreases, from p_1^0 to p_1^1, while the price..." In addition, the third line after the displayed equation should read "Since $p_1^1 < p_1^0$, the CV of the price decrease..."
- Page 169. Fourth line should read "meaning $p_1^1 < p_1^0$ and $p_k^1 \neq p_k^0$ for all other goods"
- Page 170. Figure 3.5. The vertical axis should have the initial price p_1^0 in the upper boundary of the shaded area, and the final price p_1^1 in the lower boundary.
- Page 173. The expression of EV in the middle of the page has the integration boundaries switched. It should read

$$EV(p^0, p^1, w) = \int_{p_1^0}^{p_1^0+t} h_1(p_1, \overline{p}_{-1}, u^1) dp_1.$$

- Page 174. Example 3.1, fifth line should read "the price of good x decreases from \$2 to \$1."
- Page 175, Figure 3.9b.
  - The vertical axis should have p_1^0 in the upper boundary of the shaded area, and p_1^1 in the lower boundary.
  - The arrow parallel to the vertical axis should point downwards, since the price decreases from p_1^0 to p_1^1.
  - The labels of Hicksian demand should coincide with those in Figure 3.9a: $h_1(p_1, p_{-1}, u^0)$ on the left-hand curve, and $h_1(p_1, p_{-1}, u^1)$ on the right-hand curve.
- Page 179.

- Last displayed equation, last line, should read

$$= \int_1^2 \left(\frac{2}{p_1}\right)^{1/2} \times 3.536 dp_1 \simeq 4.142.$$

- Last line before Section 3.4 should read "...would need \$4.142 to be as well off as..."

- Page 180.
  - The paragraph after the first displayed equation should read "...of the Hicksian demand, $h(p, u^0)$, which we denote as $\widetilde{h}(p, u^0)$, at the initial price..."
  - The last line of the page should read "...this "approximated" Hicksian demand, $\widetilde{h}(p, u^0)$, the same..."

- Page 181.
  - First line. It should read $D_p h(p^0, u^0) = S(p^0, w)$.
  - Second line after the second displayed equation should read $\widetilde{h}_1(p_1, p_{-1}, u^0)$, rather than $\widetilde{h}_1(p^0, u^0)$.
  - Third line after the second displayed equation should read $x_1(p_1, p_{-1}, w)$, rather than $x(p^0, w)$. The end of this line should read "...above indicates that $\widetilde{h}_1(p_1, p_{-1}, u^0)$ takes the same...".

- Page 184. Section 3.6. Paragraph starting with "We can rewrite the UMP above...". Its fourth line should read "...a single (composite) commodity y"

- Page 188. Section 3.6.1. The minimization problem at the bottom of the page should read as follows:

$$\min_{y,z} \; M = py - wz - \overline{M} \quad \text{subject to } v(y, z) = v$$

  where the worker seeks to minimize his expenditure while targeting a given utility level v, and $M = \overline{M} + wz$ by definition. From this EMP, we can find..."

- Page 189.
  - First displayed equation should have a minus sign $-$ rather than a plus sign $+$.
  - Sentence immediately after the first displayed equation. It should read as follows: "where $h_z(p, w, v) = x_z(w, p, e(w, p, v))$ by duality, i.e., $x_z(\cdot)$ is evaluated at $v = e(w, p, v)$."
  - The last displayed equation of the page should have label TE below the left-hand term, and label SE below the first term on the right-hand side. That is, the positions of these two labels should be switched.

- Page 192. Last paragraph of the page should read "... working hours, $H(\omega)$, a higher tax rate..." rather than "... working hours, $H(w)$, a higher tax rate..."

- Page 193. First displayed equation should read

$$wH(\omega) < \tau w^2 \frac{dH(\omega)}{d\omega} \quad \text{or} \quad \frac{1}{\tau} < \frac{dH}{d\omega}\frac{w}{H(\omega)}.$$

- Page 196. First sentence should read "Let us now describe the opposite case; depicted in figure 3.20."

- Page 198. Last displayed equation before Section 3.7.1 should have x_i on the numerator of left-hand side rather than x.

- Page 199. In the list of first-order conditions (displayed equations at the top of the page), add "$\frac{\partial L}{\partial x} = \frac{1}{x} - \lambda p_x = 0$," so there are three displayed equations.

- Page 200. Third displayed equation should have $h_k(p, u)$ in the numerator of the left-hand side, rather than $h(p, u)$.

- Page 202. Footnote 28 should read "...Hicksian demand $h_k(p, u)$, thus obtaining..." (That is, k should be a subscript.)

- Page 204. Second sentence should read $dw_i = -3$ and $dw_j = 3$. That is, the absolute value signs should be deleted.
- Page 210, Exercise 1, part (c) and (d). The indirect utility function of the first policy should read $v^I(q_1^w, q_2^w)$, while that of the second policy should read $v^{II}(q_1^w, q_2^w)$. This applies to both parts (c) and (d) of the exercise.
- Page 212.
  - Exercise 4. Add a space in the sixth line, so it reads "we can express it as $u(x) = x_1 + \phi(x_{-1})$,"
  - Exercise 5. Part (a) should read "Find the Walrasian demand". Part (c), in the last line of the page, should read: "Find the AV, CV, and EV when the price of good 1 decreases from $p_1 = 2$ to $p_1' = 1$."

4. **Chapter 4 - Production Theory**

- Page 222. The displayed equation at the bottom of the page should read $\frac{\partial F(y)}{\partial y_l} dy_l$ in its last term, rather than $\frac{\partial F(y)}{\partial y_k} dy_l$.
- Page 224.
  - The displayed equation at the top of the page should read $\frac{\partial f(\overline{y})}{\partial z_l} dz_l$ in its last term, rather than $\frac{\partial f(\overline{y})}{\partial z_i} dz_i$.
  - The displayed equation at the bottom of the page should read

$$\frac{\frac{\partial f(\overline{y})}{\partial z_k}}{\frac{\partial f(\overline{y})}{\partial z_l}} = \frac{MP_k}{MP_l} \equiv MRTS(\overline{z}).$$

  - The last sentence should read "Figure 4.2 depicts the combinations of inputs 1 and 2 (labor and capital, respectively) for which..."
- Page 225.
  - The terms $MRTS_{1,2}(z)$ in Example 4.1 should read $MRTS(z)$.
  - All terms $MRTS_{l,k}(z)$ in Subsection 4.1.1. should read $MRTS(z)$.
- Page 226.
  - All terms $MRTS_{l,k}(z)$ should read $MRTS(z)$.
- Page 228.
  - All terms $MRTS_{l,k}(z)$ should read $MRTS(z)$, including the legend of Figure 4.4.
- Page 229, point 3, fifth line. Replace "bottom panels of figure 4.6" with "figures 4.6b and 4.6c".
- Page 231.
  - In the third line, replace "bottom left-hand panel" with "figure 4.6b"
  - In the fourth line, replace "right-hand panel" with "figure 4.6c"
- Page 236. Last paragraph, second line should read "...using isoquants. Figure 4.16a shows constant returns..."
- Page 238.
  - First line should read "...isoquant $q = 100$ to $q = 200$ units. Figure 4.16b shows that the same..."
  - Line 3 should read "...from isoquant $q = 100$ to $q = 300$), implying..."
  - Line 4. The sentence "Finally, the right-hand panel reflects that..." should read "Finally, figure 4.16b reflects that..."
- Page 239.
  - First displayed equation should read $f(tk, tl)$ in the denominator (second ratio).
  - Line 22 should read "...proportionally (of $2^{0.51} = 1.42$), while increasing..."

- Line 24 should read "...proportionally (of $2^{1.24} = 2.36$), while increasing..."

- Page 240.
  - Line 8 should read "...using a monotonically increasing transformation..."
  - The displayed equation at the bottom of the page should read

$$F(tK, tL) = [f(tK, tL)]^{\gamma} = [t \cdot f(K, L)]^{\gamma} = t^{\gamma} [f(K, L)]^{\gamma} = t^{\gamma} F(K, L),$$

- Page 241. Legend of figure 4.17 should read "Production sets satisfying convexity (a) and violating convexity (b)."
- Page 242. Section 4.2.1, second line should read "...in the firm's output by exactly t. That is,..."
- Page 244. Line 15 should read "since, by definition, output elasticity is $\varepsilon_{q,\lambda} \equiv (dq/q)\,(d\lambda/\lambda)$, which is the..."
- Page 246. Last paragraph should read ".. dramatically from infinite (for labor amounts before the kink of the isoquant, as depicted in figure 4.22b) to zero (for labor amounts after the kink)."
- Page 249. Section 4.4. Line 5 should read "markets is negligible.)"
- Page 251.
  - The displayed equation at the top of the page (line 4) should read

$$\pi_i(p) = p \cdot y(p).$$

  - Line 9 should read "... that yield the same profits as $\pi_i(p)$ does."
- Page 253. Line 24 should read "is flatter than the isocost, $MP_1/MP_2 < w_1/w_2$, or

$$\frac{MP_1}{w_1} < \frac{MP_2}{w_2},$$

  reflecting that the marginal..."
- Page 255.
  - The sentence "Plugging (4.3) into (4.1) gives us" should read "Plugging (4.3) into (4.1') gives us"
  - The displayed equation immediately after "which, solving for z_1, yields an unconditional demand for input 1 of" should read as follows (until the end of the example at the top of page page 256):

$$z_1(w, p) = \left[\frac{1}{pA} \left(\frac{w_2}{\beta} \right)^{\beta} \left(\frac{w_1}{\alpha} \right)^{1-\beta} \right]^{\frac{1}{\alpha+\beta-1}}.$$

  Inserting $z_1(w, p)$ into (4.3), we obtain the unconditional demand for input 2 as

$$z_2(w, p) = \frac{\beta w_1}{\alpha w_2} \left[\frac{1}{pA} \left(\frac{w_2}{\beta} \right)^{\beta} \left(\frac{w_1}{\alpha} \right)^{1-\beta} \right]^{\frac{1}{\alpha+\beta-1}}.$$

  Finally, we plug $z_1(w, p)$ and $z_2(w, p)$ into production function $f(z_1, z_2) = A z_1^{\alpha} z_2^{\beta}$ to find the firm's output level. For simplicity, we assume that $A = p = 1$ and $\alpha = \beta$, which yields output

$$\begin{aligned} y(p, w) &= \underbrace{\left(\left[\left(\frac{w_2}{\alpha} \right)^{\alpha} \left(\frac{w_1}{\alpha} \right)^{1-\alpha} \right]^{\frac{1}{2\alpha-1}} \right)^{\alpha}}_{z_1} \underbrace{\left(\frac{w_1}{w_2} \left[\left(\frac{w_2}{\alpha} \right)^{\alpha} \left(\frac{w_1}{\alpha} \right)^{1-\alpha} \right]^{\frac{1}{2\alpha-1}} \right)^{\alpha}}_{z_2} \\ &= \left(\frac{w_1}{w_2} \right)^{\alpha} \left(\frac{w_2^{\alpha} w_1^{1-\alpha}}{\alpha} \right)^{\frac{2\alpha}{2\alpha-1}} \end{aligned}$$

which entails input demands

$$z_1(w,p) = \left(\frac{w_2^{\alpha} w_1^{1-\alpha}}{\alpha}\right)^{\frac{1}{2\alpha-1}} \quad \text{and}$$

$$z_2(w,p) = \frac{w_1}{w_2}\left(\frac{w_2^{\alpha} w_1^{1-\alpha}}{\alpha}\right)^{\frac{1}{2\alpha-1}} .$$

Therefore, the vector $(y(p,w), z_1(w,p), z_2(w,p))$ constitutes the firm's supply correspondence that results from the PMP. For instance, if input prices satisfy $w_1 = w_2 = 1$, and $\alpha = 1/3$, the supply correspondence becomes $\left(\frac{1}{9}, \frac{1}{27}, \frac{1}{27}\right)$. ■

- Page 257.
  - Third displayed equation should read

$$f_{zz} = -\frac{1}{z^{3/2} 4\left(1+\alpha e\right)} \quad \text{and} \quad f_{ze} = -\frac{\alpha}{2\sqrt{z}\left(1+\alpha e\right)^2}$$

  - Last paragraph should read "yields an unconditional input demand of $z(w,p) = \frac{p^2}{4w^2(1+\alpha e)^2}$, which is increasing..." That is, we are just suggesting factoring w outside the parenthesis.
- Page 258. First displayed equation should read

$$y(p) = (z(w,p), f\left(z(w,p), e\right)) = \left(\frac{p^2}{4w^2\left(1+\alpha e\right)^2}, \frac{p}{2w^2\left(1+\alpha e\right)^2}\right).$$

  So we factor w out of the parenthesis.
- Page 259. The displayed equation at the bottom of the page should read $q = \frac{\pi}{p} + \frac{w}{p} z$.
- Page 264. The last sentence of section 4.4 should read, "and hence $(p - p') \cdot (u' - y) > 0$."
- Page 266. The sentence at the center of the page should read "Solving for the Lagrange multiplier, λ, we obtain $\lambda = \frac{w_k}{\frac{\partial f(z^*)}{\partial z_k}}$."
- Page 272. The last sentence of the page, before the displayed equation, should read "This implies that the cross-price effect of output is negative, since $\frac{\partial q}{\partial w} < 0$,"
- Page 275. The fifth line after the displayed equation should read "lying above the isocost line $\{z : wz = c(w,q)\}$."
- Page 278. Example 4.8.
  - The first sentence of this example should read "Consider the Cobb-Douglas production function $f(z_1, z_2) = z_1^{\alpha} z_2^{\beta}$, where..."
  - In the first displayed equation of Example 4.8, variables z_1 and z_2 should be located below the min operator, rather than to its right-hand side.
  - In the displayed equation at the bottom of the page, $MRTS_{1,2}$ should just read $MRTS$.
- Page 279. Example 4.8.
  - In the third displayed equation, the denominator should have βw_1 rather than βw_2.
  - In the last sentence, term K should be defined as $K \equiv [\alpha/\beta]^{\theta}[\beta/\alpha]^{1-\theta}$, rather than $K \equiv [\alpha/\beta]^{\theta}[\beta/\alpha]^{-1-\theta}$.
- Page 282. Section 4.8. First line should read "...and satisfies free disposal, then the..."
- Page 284. In the last paragraph, the term $dc(w,q^*)/dq$ should be replaced for $\partial c(w,q^*)/\partial q$. It shows up three times in this paragraph.
- Page 285.
  - The last displayed equation (bottom of the page) should read

$$p \leq \frac{\partial c(q_i, q_{-i})}{\partial q_i},$$

  - Footnote 53, line 5, should read "...demand for memory chips triggered an increase..."
- Page 286. The displayed equation at the top of the page should read

$$\max_{q_1,q_2,\ldots,q_N \geq 0} \sum_{i=1}^{N} [pq_i - c(q_i, q_{-i})]$$

  That is, the term below the sum operator should read $i = 1$, rather than $i = i$.
- Page 287.
  - Subsection 4.9.2, third line should read "We provide a graphical example of an expansion path in figure 4.45, in which..."
  - Footnote 54 should read "Note that if the cross-partial derivative $\partial^2 c(q_j, q_{-j})/\partial q_j \partial q_i > 0$ $(= 0)$, the distance between the two upward sloping lines in figure 4.44 would increase in q_i (remain constant, respectively). If, instead, $\partial^2 c(q_j, q_{-j})/\partial q_j \partial q_i < 0$, the two upward sloping lines..."
- Page 289, Remark paragraph. Second line should read "...as output is increased. In this context, the firm's production function exhibits constant returns to scale and is homothetic. (Recall figure 4.19 about..."
- Page 290, footnote 57, second line should read "...input prices $w = \$25$ and $r = \$100$. It is easy to check that..."
- Page 293.
  - Footnote 59, first line should read "...in the example depicted in figure 4.47 and output..."
  - Footnote 60, second line should read "...in the bottom panel of figure 4.47 does not cross the..."
  - Footnote 61, fifth line should read "...it must be that such score is below your average."
- Page 294. In the displayed equations, all $c(q)$ should be replaced with $C(q)$, since total cost is denoted as $C(q)$ throughout the chapter.
- Page 295, line 10 (right after the first displayed equation) should read "profit-maximizing production plan $y_j(p)$, where..."
- Page 296, line 18. The word "individual" is broken up in across two lines without a hyphen. Please add a hyphen.
- Page 299.
  - Proof. Third line should read "... such that $y' \geq y$ and $y' \neq y$. That is,..."
  - Proof. Sixth line should read "... since $p >> 0$, $y' \geq y$ and $y' \neq y$. But then..."
  - Footnote 68. The third line should read "...it lies on a higher isoprofit line."
- Page 303, footnote 70 should read "...input prices are zero, as described in figure 4.52."
- Page 307.
  - Figure A4.3. The total cost function $C(q)$ is missing from panel (b).
  - Line 5 should read "the firm's costs in figure A4.4b are zero..."
- Page 309, second line should read "...and fixed costs as in case 5."
- Page 317, Exercise 5, second line should read "...constant returns to scale, that is, $\lambda f(z_1, z_2) = f(\lambda z_1, \lambda z_2)$ for any $\lambda > 0$. What is the relationship..."
- Page 318.
  - Exercise 8, First line should read "The profit function, $\pi(p)$, is defined as $\pi(p) = \max\{p \cdot y | y \in Y\}$ or alternatively as..."
  - Exercise 8, part (a), should read "...the profit function, $\pi(p)$, is convex in prices."
  - Exercise 10. The displayed equation should read

$$\pi(p, w, r) = \frac{p^2}{4w} + \frac{p^2}{4r}$$

- Page 319.
  - Exercise 12. The displayed equation at the top of the page should read

$$q = f(z_1, z_2) = \frac{\theta}{1 + z_1^{-\theta} z_2^{-\varepsilon}}$$

  - Exercise 13, line 5 should read "...is more efficient than plant 1 since plant 2's average costs increase..."
  - Exercise 14. The displayed equation at the bottom of the page should have a bracket } at the end.
- Page 321, part (d) should end with "...the equilibrium output."

5. **Chapter 5 - Choice under Uncertainty**

- Page 328.
  - Line 1, should read "...probability p_2^1 of outcome 2 occuring, and..."
  - Figure 5.5: title should be "Compound lottery and its associated reduced lottery (example 5.1)".
- Page 329.
  - Example 5.1 shoud add the following explanation, so the last sentence reads "...that assigns the same probability weight to each lottery. To understand the position of each lottery in Figure 5.6a, first draw a dotted line connecting vertex 1 to the mid-point of the side connecting vertexes 2 and 3, which essentially divides Machina's triangle in two halves. Second, since both lotteries L_2 and L_3 assign a probability of $\frac{1}{4}$ to outcome 1, truncate the dotted line you just drew by $\frac{1}{4}$. Therefore, the line segment connecting vertex 1 to the point of truncation (about $\frac{3}{4}$ of the line segment) represents the "average lottery" where lottery L_2 and L_3 occur with equal probability, that is,

$$\begin{aligned} \frac{L_2 + L_3}{2} &= \frac{1}{2}\left(\frac{1}{4}, \frac{3}{8}, \frac{3}{8}\right) + \frac{1}{2}\left(\frac{1}{4}, \frac{3}{8}, \frac{3}{8}\right) \\ &= \left(\frac{1}{4}, \frac{3}{8}, \frac{3}{8}\right) = L_2 = L_3 \end{aligned}$$

    Consider now a compound lottery where L_1 occurs with probability $\frac{1}{3}$ and the above average lottery $\frac{L_2+L_3}{2}$ with the remaining probability $\frac{2}{3}$. Graphically, this compound lottery must be $\frac{2}{3}$ away from vertex 1 and $\frac{1}{3}$ away from the point of truncation, respectively, such that

$$\begin{aligned} L &= \frac{1}{3}L_1 + \frac{2}{3}\frac{L_2 + L_3}{2} \\ &= \frac{1}{3}(1, 0, 0) + \frac{2}{3}\left(\frac{1}{4}, \frac{3}{8}, \frac{3}{8}\right) \\ &= \left(\frac{1}{3} + \frac{1}{6}, \frac{2}{3}\frac{3}{8}, \frac{2}{3}\frac{3}{8}\right) \\ &= \left(\frac{1}{2}, \frac{1}{4}, \frac{1}{4}\right) \end{aligned}$$

    Therefore, the compound lottery has outcome 1 occuring with probability $p_1 = \frac{1}{2}$, outcome 2 occuring with $p_2 = \frac{1}{4}$, and outcome 3 occuring with $p_3 = \frac{1}{4}$."
  - Example 5.2. Second paragraph, first line, should read "The reduced lottery is therefore $(1/2, 1/4, 1/4)$, which is..."
- Page 330, Figure 5.6.
  - The end title should read "...compound lottery (example 5.2)"
  - Figure 5.6a (at the top of the page) should not have x_2 in its left-hand side.

- Figure 5.6b (at the bottom of the page) should have probabilities α_4 and α_5 in the branches leading to lotteries L_4 and L_5, rather than α_1 and α_2.

- Page 331, Figure 5.7.
  - The title should read "Simplex of reduced lottery (example 5.2)"
  - The compound lottery should read $(1/2, 1/4, 1/4)$, instead of $(1/2, 1/2, 1/4)$.

- Page 332.
  - Line 12 (in the second paragraph), should read "In particular, $|\text{supp}(L)| = 2$ while $|\text{supp}(L')| = 91$, entailing that..."
  - Line 25 (after three displayed equations) should read "...than in lottery L', meaning that $p_2 > p_2'$. As an example,..."
  - Line 28 (last sentence before bullet point 4) should read "...despite the fact that L assigns a larger probability..."

- Page 336.
  - Example 5.4, line 5, should read "which $\frac{1}{2}L + \frac{1}{2}L \nsim \frac{1}{2}L' + \frac{1}{2}L$. Intuitively, if the individual..."
  - Footnote 5. It should end "...more attractive than that of A and C."

- Page 337.
  - Fourth line should read "$\max\{0.4, 0.5, 0\} = 0.5$ and $\max\{0.5, 0, 0.5\} = 0.5$ implies that the decision maker..."
  - Last line should read "associated probability $\alpha_k > 0$." rather than "associated probability $a_k > 0$."

- Page 338. line 18 (last sentence before paragraph on Cardinality), should read "...probability of lottery k occurring, α_k, and then repeat this proces..."

- Page 339,
  - Line 4 (first paragraph) should read "...weakly preferred to lottery L' if and only if $U(L) \geq U(L')$, or..."
  - The label of Figure 5.11 (right hand corner) should read "If $L \sim L'$, then $L \sim \alpha L + (1-\alpha)L'$" That is, the equal sign = should be replaced for a plus sign, +.

- Page 340. Second bullet, third line, should read "compound lotteries $\frac{1}{3}L + \frac{2}{3}L''$ and $\frac{1}{3}L' + \frac{2}{3}L''$."

- Page 341, figure 5.13. The title ends with a full-stop, but the title of other figures have no full stops at the end.

- Page 343. In the section "Machina's paradox", the paragraph starting with "Intuitively, the first lottery..." should finish with "Using the fact that the decision maker prefers M to H, which we express as $M \succ H$, we can construct the compound lotteries $\frac{99}{100}T + \frac{1}{100}M$ and $\frac{99}{100}T + \frac{1}{100}H$. From the IA we have that
$$\frac{99}{100}T + \frac{1}{100}M \succ \frac{99}{100}T + \frac{1}{100}H$$
which implies $L_1 \succ L_2$. " The paragraph starting with "Second, from the assumption..." until "we can conclude that $L_1 \succ L_2$." should be deleted.

- Page 345, section 5.4.1. Second line, there should be a space between $g(\cdot)$ and "to".

- Page 347, the last line should read "review by Machina and Siniscalchi 2014)."

- Page 358, Figure 5.23. The arrow and label of the certainty equivalent $c(F, u)$ at the right-hand side of the figure should not point to a payoff of \$3, but to the dotted line between \$2 and \$3.

- Page 359, Figure 5.25. The dotted line corresponding to $u(2)$ and $\left(\frac{1}{2} + \pi\right) u(3) + \left(\frac{1}{2} - \pi\right) u(1)$ should both be at the same height.

- Page 361. Paragraph before Example 5.8, should read "... which we write as $\partial r_A(x)/\partial x < 0$. Intuitively, this implies..."

- Page 364, Footnote 21, Line 3, should add a parenthesis in the exponent of the last expression, so it reads "However, $u_A'(x_2)/u_B'(x_2) = \frac{a_A}{a_B} e^{(a_B - a_A)x_2}$, while..."

- Page 366:
  - Subsection 5.8.1, Line 3 should read "of relative risk aversion, $r_R(x)$, is that..."
  - Footnote 22 should read "...Fishburn and Porter (1976), Cheng et al. (1987), Mitchell (1994), and..."
  - Last displayed equation should add an equality sign so it reads

$$r'_A(x) = -\frac{u''' \cdot u' - (u'' \cdot u'')}{(u')^2} = -\frac{u''' \cdot u' - (u'')^2}{(u')^2} = -\frac{u'''}{u'} + \left(\frac{u''}{u'}\right)^2$$

- Page 367, Example 5.11:
  - Line 3 of Example 5.11 should read "...and 5.10 (CRRA). In the case..."
  - Line 7 of Example 5.11 should read "... of the CRRA in example 5.10, where..."
  - Last displayed equation should read

$$K_R(x) = (1-b) - x\frac{-\frac{1-b}{x^2}}{\frac{1-b}{x}} = 1 - b + 1 = 2 - b,$$

  - Last line should read "implying that, in this case, $K_R(x) > r_R(x)$."
- Page 368:
  - Title of subsection 5.8.2 should read "Cautiousness and Temperance"
  - First line immediately after the first displayed equation should read "...as measuring the "cautiousness" of the individual, since a positive ration $C(x) > 1$ implies..."
  - In the fourth line after the first displayed equation, spaces should be added, so it reads "...utility function yeilds $C(x) = 1$, whereas the CRRA entails $C(x) < 1$. The literature..."
  - The fifth line after the first displayed equation should read "...the coefficient of "temperance," as $T(x) = -u''''(x)/u'''(x)$, where as individual..."
  - Sixth line after the first displayed equation should read "...function is negative, $u''''(x) \leq 0$, and describes..."
- Page 369, displayed equation in Example 5.12 should have the denominator to the power of $1/\beta$, so it reads

$$w(p) = \frac{p^\beta}{[p^\beta + (1-p)^\beta]^{\frac{1}{\beta}}}$$

- Page 374, Figure 5.31b (bottom of the page). The dashed line (corresponding to lottery G) should go up at a payoff of \$4, while the solid line (corresponding to lottery F) should continue until payoff \$5.
- Page 377. Figure 5.33a (top of the page) should have $F(.)$ on the top of the figure, and $G(.)$ on the bottom.
- Page 378:
  - Footnote 26 should read "Note that, as in example 5.14, we cannot..."
  - The last line and displayed equation at bottom of the page should be replaced for: "Integrating both sides from 0 to x, we find

$$\begin{aligned}\int_0^x HR(t)\,dt &= -\int_0^x \frac{d}{dt}\ln(1-F(t))\,dt \\ &= -\left[\ln[1-F(x)] - \ln[1-F(0)]\right] \\ &= -\ln[1-F(x)]\end{aligned}$$

  since $\ln[1-F(0)] = \ln[1] = 0$, this expression simplifies to

$$\int_0^x HR(t)\,dt = -\ln[1-F(x)]$$

  Multiplying both sides by -1, applying exp on both sides, and solving for $F(x)$, we obtain

$$F(x) = 1 - \exp\left(-\int_0^x HR(t)\,dt\right)."$$

- Page 379:
  - The text after the third displayed equation, and before the section on Likelihood ratio dominance, should read be replaced with the following: "Then, integrating both sides, we obtain

$$\begin{aligned}\int_x^\infty RHR(t)\,dt &= \int_x^\infty \frac{d}{dt}\left(\ln F(t)\right)dt \\ &= \ln F(\infty) - \ln F(x) \\ &= -\ln F(x)\end{aligned}$$

    since $F(\infty) = 1$, and $\ln(1) = 0$. Solving for $F(x)$, we have

$$F(x) = \exp\left(-\int_x^\infty RHR(t)\,dt\right).$$

    Therefore, if $RHR_F(x) \geq RHR_G(x)$, then

$$F(x) = \exp\left(-\int_x^\infty RHR_F(t)\,dt\right) \leq \exp\left(-\int_x^\infty RHR_G(t)\,dt\right) = G(x).$$

    which simplifies to $F(x) \leq G(x)$. In words, reverse hazard rate dominance implies FOSD; but the converse is not necessarily true."
  - Footnote 28. The second line should read "...a monetary amount $x \in [0, \$200]$. After fives tries,..."
- Page 382.
  - Last sentence before Subsection 5.11.1 should read "for every state s, where $\pi_s \geq 0$ and $\beta_s \in \mathbb{R}$ (and similarly for..."
  - The last displayed equation should have a *prime* on the right-hand side, so it reads

$$\sum_s \pi_s(x_s)\,u_s(x_s) \geq \sum_s \pi_s(x'_s)\,u_s(x'_s)$$

- Page 384. Fourth line of Subsection 5.12.1 should have an extra space so it reads "...another lottery G if the..."
- Page 386. The sentence immediately before the second displayed equation "... that in lottery L_B" (rather than lottery LB); and the following sentence should read "...and similarly for lottery L_A," (rather than lottery LA).
- Page 387. Subsection 5.12.2, previous to last line of the first paragraph should read "...then an example of a capacity is..."
- Page 388.
  - The first sentence in subsection 5.12.3 should read "Klibanoff et al. (2005) offered a framework..."
  - From footnote #33 onwards, the corresponding number in the main text is shifted by +1. That is, footnote #33 in the footnote refers to #34 in the main text, and similarly for the remaining footnotes in this chapter.
  - Third paragraph should read "...while $1-\lambda$ captures the "degree of ambiguity: about $w(A)$..."
  - Footnote 34, second line should read "...integral of F with respect to..."
- Page 389. Example 5.18. The first sentence should read "Consider a decision maker (DM) with utility..."
- Page 390.
  - The sentence after the second displayed equation should read "We can now plug in parameters, α_1 and α_2, into the utility function $u(\cdot)$."
  - The third displayed equation should have 7.5 instead of 75 that is pre-multiplied to term $(1 + 2x)$.

– The last displayed equation should read

$$\begin{aligned}&\left(1,875-0.375\left[1+0.75x\right]+1.5-3\left[1+2x\right]\right)Eu\left(x;\alpha_1\right)^{-0.5}\\&+\left(6.75-1.35\left[1+0.75x\right]+2-0.4\left[1+2x\right]\right)Eu\left(x;\alpha_2\right)^{-0.5}=0\end{aligned}$$

- Page 392, Second line should read "the monetary payoff associated with every state of nature:"
- Page 394. The first displayed equation should have a *prime* on the right-hand side, so it reads

$$\left(x_1,x_2,...,x_S\right)\succsim\left(x_1',x_2',...,x_S'\right)\quad\text{if and only if}\quad\sum_s\pi_s\left(x_s\right)u_s\left(x_s\right)\geq\sum_s\pi_s\left(x_s'\right)u_s\left(x_s'\right).$$

- Page 395, in the paragraph before Example A5.2, the third line should read "...whereby $u_1(\cdot) = u_2(\cdot) = \ldots = u_S(\cdot)$, then the slope..."
- Page 397, the first displayed equation in the Extended EU theorem (grey box) should be centered. Now it shows up on the left-hand side of the page.
- Page 398, Exercise 3, first displayed equation should read

$$\begin{aligned}v\left(g\right)&=\left(1+a_1\right)^{p_1}\times\left(1+a_2\right)^{p_2}\times\cdots\times\left(1+a_n\right)^{p_n}\\&=\sum_{i=1}^{n}\left(1+a_i\right)^{p_i}.\end{aligned}$$

- Page 400, Exercise 7.
  - The square root should cover the x, so it reads $u(x) = \sqrt{x}$.
  - Part (d) of the exercise should read "...answers from parts (a) and (b), find the risk premium..."
- Page 401, Exercise 9. The sentence after the displayed equation should read "where $\alpha \neq 0$ and $\beta \neq 1$. Find the..."
- Page 402, Exercise 11, third bullet point, third line should read "..., but seeks to balance his portfolio so as to maximize his expected utility. Denote by..."
- Page 404, Exercise 17, part (a) should read "Find the coefficient of absolute risk aversion, $r_A(w, u)$. Does it increase..."
- Page 406, Exercise 23.
  - First line of the exercise should read "...for exactly two periods, $t = \{0, 1\}$. Let $c_i \in \mathbb{R}$ denote..."
  - Last line before part (a) should read "Thus his consumption in period 0 is $w_0 - s$, and his consumption..."
- Page 407. Please add a fullstop at the end of the first bullet point, so it reads "...and denote by w_0 the farmer's initial income."
- Page 408, Exercise 26.
  - The budget constraint should read "$p_1x_1 + p_2x_2 \leq w$;" and lie immediately below the max operator.
  - The last displayed equation of the exercise should read

$$\frac{\pi}{1-\pi}\frac{u'\left(x_1^*\right)}{u'\left(x_2^*\right)}=\frac{p_1}{p_2}.$$

  - The last paragraph should be in line with previous paragraphs, rather than starting an inch to the left-hand side.
- Pages 409-410. In the References section, please add the following references:
  - Cheng, H., M. Magill, and W. Shafer, 1987. Some Results on Comparative Statics Under Uncertainty, *International Economic Review,* 28 (2), 493-507.

- Eeckhoudt, L., 2012. Beyond Risk Aversion: Why, How and What's Next?, *The Geneva Risk and Insurance Review,* 37: 141-155.
- Fishburn, P.C. and R.B. Porter, 1976. Optimal Portfolios with One Safe and One Risky Asset: Effects of Changes in Rate of Return and Risk, *Management Science*, 22 (10), 1064-73.
- Hahn, F. H., 1970. Savings and Uncertainty, *Review of Economic Studies*, 37 (1): 21-24.
- Mitchell, D. W., 1994. Relative risk aversion with Arrow-Debreu securities, *International Economic Review,* 35 (1): 257-258.
- Meyer, D. J., and J. Meyer, 2005. Relative Risk Aversion: What Do We Know?, *Journal of Risk and Uncertainty*, 31 (3): 243-262.
- Rothschild, M. and J. E. Stiglitz, 1971. Increasing Risk II: Its Consequences, *Journal of Economic Theory,* 3 (1), 66–84.
- Tversky, A. and D. Kahneman, 1986, Rational Choice and the Framing of Decisions, *The Journal of Business*, 59 (4), Part 2: The Behavioral Foundations of Economic Theory: 251-278.

5. **Chapter 6 - Partial and General Equilibrium**

- Page 412.
  - Second displayed equation should have a prime in the right-hand term (rather than a comma), so it reads "$p^* \leq c_j'(q_j^*)$ with equality if $q_j^* > 0$."
  - Section 6.1.2. First paragraph. Third line should add a space between "from" and "x_i units". Fifth line should add a space between "good" and "x_i" so it reads "an additional unit of good x_i."
- Page 417.
  - The last two paragraphs add too much space between the min and max operators and the objective functions on their right-hand side. They should read "... for the most efficient firm, $\min_j c_j'(0)$. If this condition holds..."
  - Similarly, the end of the last paragraph should read "Note that if, instead, $\max_i v_i'(0) < \min_j c_j'(0)$ holds, we cannot guarantee that..."
- Page 419. Line 3 (end of the example) should read as "$s_B(p) = 10p = 10 \times 5 = 50$ units."
- Page 421.
  - Line 5 has a missing parenthesis, so it should read "decreasing in prices, $x'(p^*(t) + t) < 0$, and the aggregate supply"
  - Line 15. The $<$ symbol should read $\leq$.
  - Line 21 should read "... decreasing output from $x^*(p(0))$ to $x^*(p(t))$. Regarding prices, note that..."
- Page 422. Last paragraph should read "...the price received by producers falls by \$1 for every..."
- Page 424. Example 6.3.
  - The title of the example should be "*Sales tax-Application*" rather than "*Ad valorem taxes*"
  - Second line of the example should read "imposing a sales tax t per unit."
  - The asterisks in the first displayed equation should only show up for the first ratio of the first and second displayed equation; nowhere else.
  - The third displayed equation should read as $p^{*\prime}(0) + 1$ (it now has a missing asterisk).
- Page 425. Previous to last paragraph should read "...from additional units of the good..."
- Page 426.
  - First displayed equation should a bracket encapsulating the integrand, so it reads as

$$S(x) = S_0 + \int_0^x [p(s) - c'(s)]\, ds$$

- Last sentence should add a space between "to" and "x" so it reads "...with respect to x, we obtain the..."
- Footnote #7 should read "Many economic applications consider..."

- Page 427. Figure 6.11 should have s instead of x as the variable of integration (elements inside the bracket), so it reads $\int_0^x [p(s) - c'(s)]\, ds$.
- Page 428. Example 6.4.
  - Second paragraph of the example, third line, has a missing square bracket, so it should read "$x^* = a - b[2a/(2b + J)] = aJ/(2b + J)$. In this context,..."
  - Second displayed equation should have a prime, rather than a comma, in the cost function, so it reads $c'(x)dx$.
  - Third displayed equation. Add $= \frac{a^2}{2b\left(1+\frac{2b}{J}\right)}$ at the end of this displayed equation. In addition, eliminate the comma at the end. It can be interpreted as a prime in parameter J of the denominator.
  - The last line of the example has a missing ratio sign (/), so it should read "...since $\frac{\partial S(x^*)}{\partial J} = \frac{a^2}{(2b+J)^2} > 0$."
  - Subsection 6.4.1. Second line should read "... units of good 1 and 2, respectively. For simplicity, assume that both consumers' utility function is continuous and strictly increasing." Then, the next paragraph should continue with "Figure 6.12a depicts the so-called Edgeworth box..."

- Page 432.
  - The first displayed equation should have i's on the superscripts after the max operator, rather than 1's, so it reads $u^i(\mathbf{x}^i)$.
  - The second displayed equation should read

$$\sum_{i=1}^{I} x_k^i \leq \sum_{i=1}^{I} e_k^i \quad \text{for every good } k = \{1, 2\}$$

  - Line 5 should read "individual i's utility without reducing the utility of any other individual $j \neq i$ below a given level $\overline{u}_j$ and satisfying feasibility for every good k (which in an economy with two consumers, A and B, implies that $x_k^A + x_k^B \leq e_k^A + e_k^B$ for every good k)."
  - The third displayed equation should read

$$\begin{aligned}
&\mathcal{L}\left(\mathbf{x}^1, \ldots, \mathbf{x}^I; \lambda^1, \ldots, \lambda^{i-1}, \lambda^{i+1}, \ldots, \lambda^I, \mu\right) \\
&= u^i\left(\mathbf{x}^i\right) + \lambda^1\left[u^1\left(\mathbf{x}^1\right) - \overline{u}^1\right] + \ldots \\
&+ \lambda^{i-1}\left[u^{i-1}\left(\mathbf{x}^{i-1}\right) - \overline{u}^{i-1}\right] + \lambda^{i+1}\left[u^{i+1}\left(\mathbf{x}^{i+1}\right) - \overline{u}^{i+1}\right] + \ldots \\
&+ \lambda^I\left[u^I\left(\mathbf{x}^I\right) - \overline{u}^I\right] \quad + \mu_1\left[\sum_{i=1}^{I} e_1^i - \sum_{i=1}^{I} x_1^i\right] + \mu_2\left[\sum_{i=1}^{I} e_2^i - \sum_{i=1}^{I} x_2^i\right] \\
&= u^i\left(\mathbf{x}^i\right) + \sum_{j \neq i} \lambda^j\left[u^j\left(\mathbf{x}^j\right) - \overline{u}^j\right] + \mu_1\left[\sum_{i=1}^{I} e_1^i - \sum_{i=1}^{I} x_1^i\right] + \mu_2\left[\sum_{i=1}^{I} e_2^i - \sum_{i=1}^{I} x_2^i\right]
\end{aligned}$$

  - The paragraph immediately after the third displayed equation should read "Taking first-order conditions with respect to x_k^i yields $\partial L/\partial x_k^i = \left(\partial u^i(\mathbf{x}^i)/\partial x_k^i\right) - \mu_k \leq 0$ for every good $k = \{1, 2\}$ of consumer i, whereas when we take first-order conditions with respect to x_k^j for every individual $j \neq i$, we obtain $\partial L/\partial x_k^j = \lambda^j\left(\partial u^j(\mathbf{x}^j)/\partial x_k^j\right) - \mu_k \leq 0$ for every good k. Finally, taking first-order conditions with respect to Lagrange multipliers λ^j and μ_k, yields the constraints $u^j(\mathbf{x}^j) \geq \overline{u}_j$ for every individual $j \neq i$ and $\sum_{i=1}^{I} x_k^i \leq \sum_{i=1}^{I} e_k^i$ for every good k, respectively. In the case of interior solutions, the first expression can be written as

$\partial u^i(\mathbf{x}^i)/\partial x_1^i = \mu_1$ for good 1 and, similarly, $\partial u^i(\mathbf{x}^i)/\partial x_2^i = \mu_2$ for good 2. Dividing them yields

$$\frac{\partial u^i(\mathbf{x}^i)/\partial x_1^i}{\partial u^i(\mathbf{x}^i)/\partial x_2^i} = \frac{\mu_1}{\mu_2}.$$

From the second expression, we find $\lambda^j \left(\partial u^j(\mathbf{x}^j)/\partial x_1^j\right) = \mu_1$ for good 1 and, similarly, $\lambda^j \left(\partial u^j(\mathbf{x}^j)/\partial x_2^j\right) = \mu_2$. Dividing these equations, we obtain

$$\frac{\partial u^j(\mathbf{x}^j)/\partial x_1^j}{\partial u^j(\mathbf{x}^j)/\partial x_2^j} = \frac{\mu_1}{\mu_2}.$$

Setting the above displayed equations equal to each other, we find a compact condition for Pareto efficiency

$$\frac{\partial u^i(\mathbf{x}^i)/\partial x_1^i}{\partial u^i(\mathbf{x}^i)/\partial x_2^i} = \frac{\partial u^j(\mathbf{x}^j)/\partial x_1^j}{\partial u^j(\mathbf{x}^j)/\partial x_2^j}, \quad \text{or} \quad MRS_{1,2}^i = MRS_{1,2}^j$$

for every consumer $j \neq i$. That is,..."

- Delete footnote 9.
- Footnote #10 should end with "..in the economy, $MRS_{k,l}^i = MRS_{k,l}^j$."

- Page 433. Line 7 should read "...their slopes satisfy $MRS_{1,2}^A = MRS_{1,2}^B$. In this context, $MRS_{1,2}^A = MRS_{1,2}^B$ implies..."
- Page 436. Line 6.
  - Last line of the first paragraph should read "$\mathbf{p} \cdot \mathbf{e}^i = p_1 e_1^i + \ldots + p_L e_L^i$ dollars to be used..."
  - Line 12 (previous to last line of the page) should read "Figure 6.16 separately depicts the aggregate demand, $\sum_{i=1}^I x_k^i \left(\mathbf{p}, \mathbf{p} \cdot \mathbf{e}^i\right)$ for good k and its aggregate supply $\sum_{i=1}^I e_k^i$, both in the left panel, and the resulting excess demand for this good k in the right panel."
- Page 437.
  - First line. The excess demand function just needs to be bolded but not capitalized, so it reads "The excess demand function $\mathbf{z}(\mathbf{p}) \equiv (z_1(\mathbf{p}), z_2(\mathbf{p}), \ldots, z_L(\mathbf{p}))$ satisfies some..."
  - Numbered point 1 should have the title *Walras' Law.*
- Page 438.
  - The first definition at the top of the page should read "Walrasian Equilibrium Allocation (WEA)".
  - In the subsection "Uniqueness of WEA" at the middle of the page, the second line should read "..function in the left panel of figure 6.17 but violated in its right panel. As we next show,..."
  - Last displayed equation should have a prime in the left-hand term (rather than a comma), so it reads $\mathbf{p}'$, for consistency with price vectors in the previous paragraph.
  - Footnote 11 should read "... see Varian (1992), pp. 321-22."
- Page 439. Example 6.6 should read "Consider our setting in Example 6.5. We can now find the Walrasian demands for each good and each consumer.

  Consumer A. From his utility maximization problem, we obtain

$$MRS_{1,2}^A = \frac{p_1}{p_2},$$

or $\frac{x_2^A}{x_1^A} = \frac{p_1}{p_2}$, which rearranges to $p_1 x_1^A = p_2 x_2^A$. Inserting this into consumer A's budget constraint yields..."

- Page 440 should read "which is consumer A's demand for good 2.

  Consumer B. The process is similar for this indidual. From his utility maximization problem, we find

$$MRS_{1,2}^{B} = \frac{p_1}{p_2},$$

  or $\frac{x_2^B}{x_1^B} = \frac{p_1}{p_2}$, which rearranges to $p_1 x_1^B = p_2 x_2^B$. Inserting this into consumer B's budget constraint yields..."

- Page 441.
  - The first displayed equation should read

$$p_1\left(50 + 25\frac{p_2}{p_1}\right) = p_2 x_2^B \quad \Rightarrow \quad x_2^B = 25 + 50\frac{p_2}{p_1}.$$

  - The third displayed equation should read

$$\left(50 + 175\frac{p_2}{p_1}\right) + \left(50 + 25\frac{p_2}{p_1}\right) = 100 + 200\frac{p_2}{p_1} = 200,$$

  - Line 5 should read "...yields our Walrasian equilibrium allocation, WEA,"
- Page 442. Line 11 should read "referred to as the *First Welfare Theorem*, as we compactly..."
- Page 443. Line 5 should read "As shown by the *Second Welfare Theorem*, the answer to this question is yes."
- Page 444. Figure 6.20 should be defined in terms of consumers A and B, instead of 1 and 2.
- Page 445. Example 6.7.
  - Last line of first paragraph should read "...endowments acheiving that this allocation becomes..."
  - Paragraph after the first displayed equation. First line should read "...the feasibility condition for good 1, $x_1^B = x_2^B$, and..." Second line of this paragraph should read "Substituting this value into the feasibility condition for good 2, gives..."
- Page 446. Paragraph after the second displayed equation should read "In addition, from the UMP of consumer B, we know that he consumes bundles at the kink of his indifference curves, satisfying $x_1^B = x_2^B$. Since in this context there are a total endowment of 4 units of each good, $x_1^B = x_2^B$ entails a similar property for consumer A, $x_1^A = x_2^A$, implying that the price ratio becomes $p_1 = x_2^A / x_1^B = 1$. All that remains..."
- Page 447. Line 5 should read "...assuming that the total endowment of each good is still 4."
- Page 448. Footnote 14. Second line should read "...the isoprofit lines in figure 6.24, while..."
- Page 449.
  - Line 5. There is a + sign missing at the end of the sentence, so it should read $\mathbf{y}(\mathbf{p}) = y^1(\mathbf{p}) + y^2(\mathbf{p}) + ... + y^J(\mathbf{p})$.
  - Line 8 should read "profits, where $0 \leq \theta_{ij} \leq 1$, and that firm j's profits..."
  - Line 14 (immediately after the first displayed equation), should read "where only the last term, $\sum_{j=1}^{J} \theta_{ij}\pi^j(\mathbf{p})$, is new relative to..."
- Page 450.
  - The second displayed equation should read

$$\mathbf{z}(\mathbf{p}) \equiv (z_1(\mathbf{p}), z_2(\mathbf{p}), \ldots, z_L(\mathbf{p})).$$

  - Definition box for "WEA with production". Point 1 should read "...becomes the i^{th} entry of..." Similarly, point 2 should read "...becomes the j^{th} entry of..."
- Page 451. Paragraph after the last displayed equation, second line should read "...is decreasing in good 1 (as x_1 increases, MU_1^i decreases while MU_2^i increases). In contrast, $MRT_{1,2}^m = F_{2m}/F_{1m}$ is increasing in good 1. Intuitively,..."

- Page 452. Example 6.8. Sixth line should read "...consumer B is endowed with..." rather than "...consumer 2 is endowed with..."
- Page 454. Previous to last line has one unnecessary parenthesis, so it should read "...we know that $K_1 + K_2 = K^A + K^B = 3$, or..."
- Page 455. The line after the first displayed equation has one unnecessary parenthesis, so it should read "...we know that $L_1 + L_2 = L^A + L^B = 2$, or..."
- Page 456.
  - The displayed equations at the bottom of the page should have i superscripts rather than 1, and j superscripts rather than 2, so they read as follows

$$\max_{x_1^i, x_2^i, x_1^j, x_1^j, L_1, K_1, L_2, K_2 \geq 0} u^i(x_1^i x_2^i)$$

$$\text{subject to} \quad u(x_1^j, x_2^j) \geq \overline{u}^j,$$

  - The last line should read "$x_1^i + x_1^j \leq F_1(K_1, L_1)$ and $x_2^i + x_2^j \leq F_2(K_2, L_2)$ (technological feasibility), and..."
- Page 457.
  - First displayed equation. The 1 superscripts should read i, and 2 superscripts should read j, so the first line of the equation at the top of the page reads

$$\begin{aligned}\mathcal{L} = u^i\left(x_1^i, x_2^i\right) + \lambda\left[u^j\left(x_1^j, x_2^j\right) - \overline{u}^j\right] + \mu_1\left[F_1(L_1, K_1) - x_1^i - x_1^j\right] \\ + \mu_2\left[F_2(L_2, K_2) - x_2^i - x_2^j\right] + \delta_L\left[\overline{L} - L_1 - L_2\right] + \delta_K\left[\overline{K} - K_1 - K_2\right]\end{aligned}$$

  - Paragraph after first displayed equation needs some space between "L_j" and "and", so it reads "... to inputs L_j and K_j yield..."
  - Line 3 should read "... in barter economies, $MRS_{1,2}^i = MRS_{1,2}^j$. The first-order conditions..."
  - Footnote 16 should read as "Indeed, if we move labor from firm 1 to firm 2, the production..."
- Page 458. First paragraph (fourth line) needs some space between "$(\mathbf{x}, \mathbf{y})$" and "without", so it reads "...better off than WEA $(\mathbf{x}, \mathbf{y})$ without making..."
- Page 459.
  - Definition box. Third line should read "income transfers $(T_1, T_2, ..., T_I)$ redistributing income..."
  - Example 6.10. The last line of the first paragraph should add a space between "Consumer" and "A's" so it reads "Consumer A's budget constraint becomes"
  - Example 6.10. The last two displayed equations should end with T_A rather than with T_1.
- Page 460.
  - Second displayed equation. Please replace T_1 for T_A.
  - Third, fourth, and sixth displayed equations. Please replace T_2 for T_B.
  - Last line before Section 6.5 should read "Clearly, $T_A + T_B = 0$, and thus these transfers..."
- Page 461.
  - First line of the page should add a space between "firm" and "j's" so it reads "...denote firm j's demand for factor 1, and..."
  - Line 12 should read "Applying Shephard's lemma on firm j's cost $c_j(w_1, w_2)$, we obtain $\partial c_j(w_1, w_2)/\partial w_i = z_{ij}(w)$ where $i = \{1, 2\}$, which results in

$$\begin{aligned}z_{11}(w)\, dw_1 + z_{21}(w)\, dw_2 = dp_1 \\ z_{12}(w)\, dw_1 + z_{22}(w)\, dw_2 = dp_2\end{aligned}$$

  - The second last line should read "$dw_2 = (-z_{12}/z_{22})\, dw_1$. We can now..."

- Page 462.
  - The second displayed equation should read

$$\frac{dw_2}{dp_1} = -\frac{z_{12}}{z_{11}z_{22} - z_{12}z_{21}}$$

  - Last sentence should read "...or, rearranging, that $K_1L_2 = 9K_2L_1$. Substituting these values..."
- Page 463.
  - The first displayed equation should read

$$0.448\left(\frac{p_1p_2}{rw}\right)^{\frac{8}{3}} - 1 > 0 \implies \frac{p_1p_2}{rw} > 1.35$$

  - The second line should read "Next, observe that both z_{22} and z_{12} are trivially positive."
  - The third displayed equation should read

$$\frac{dw_2}{dp_1} = -\frac{z_{12}}{z_{11}z_{22} - z_{22}z_{21}} < 0$$

- Page 464.
  - Second displayed equation has a comma at the end, which is not in line with the horizontal line of the ratio. Please delete the comma.
  - Second line after second displayed equation had a missing / symbol, so it should read "$(\partial y_i/\partial L)/y_i \equiv \%\Delta y_i$, which is the percentage increase..."
  - Line immediately after the fourth displayed equation had a missing + sign, so it should read "and that $\gamma_{L1} + \gamma_{L2} = 1$, implying that..."
  - Line 13 should read "... for firm 1 and $\gamma_{K2} < \gamma_{L2}$ for firm 2. As a consequence..."
  - Line 18 should read "... in the good whose production is more intensive in..."
  - Last paragraph needs a full stop.
- Page 465.
  - Line 8 should read "$\gamma_{K2} < \gamma_{L2}$. As a consequence the expression..."
  - Line 11-12 should read "Hence, $\%\Delta y_1 > 0 > \%\Delta y_2$. In words, as capital endowment..."
- Page 466. Third displayed equation should have a $*$ symbol, so it reads

$$K_2^* = \frac{1}{3}K_1^* = \frac{5}{4}.$$

- Page 467. Line 13 should read "As a consequence, the production of good 1 should decrease and that of good 2 should increase."
- Page 469.
  - Line 1 shoudl read "...has an endowment vector..."
  - The title "Equal treatment at the Core" should be part of the paragraph, rather than displayed above the paragraph.
  - Second line of the "Equal treatment at the Core" paragraph should read "...for every two consumers q and q' of the same type i, where $q \neq q' \in \{1, 2, ..., r\}$; and for every type $i \in I$."
- Page 472.
  - The title "The Core Shrinks as the Economy Enlarges" should be part of the paragraph, rather than displayed above the paragraph.
  - First line of the proof paragraph should read "Since we seek to show that the core shrinks in r, that is,$C_1 \supseteq C_2 \supseteq ... \supseteq C_{r-1} \supseteq C_r \supseteq ...$, it suffices to find that, for any replication $r > 1$, $C_{r-1} \supseteq C_r$. First, suppose that allocation $\mathbf{x} = (\mathbf{x}_1, \mathbf{x}_2, ..., \mathbf{x}_I) \in C_r$. Intuitively, we cannot find..."

- Page 474. Third paragraph. The last line should read "both types of consumers 1 (11 and 12), while one of type-2 consumers (for instance, 21) receives the same bundle as in allocation $\widetilde{\mathbf{x}}$, implying that" The three displayed equations are correct.
- Page 475. Second line. The negation sign should be clearer, so it reads "the twofold economy, $\widetilde{\mathbf{x}} \nsubseteq C_2$, since we..."
- Page 476. First line after the displayed equation. Please insert the following footnote, immediate before "Hence consider a coalition S with...":
  - Allocation $\widehat{\mathbf{x}}$ can then be understood as a weighted average, assigning weight $1/r$ to allocation $\widetilde{\mathbf{x}}^1$ and the remaining weight, $(r-1)/r$, to the endowment $\mathbf{e}^1$. Graphically, allocation $\widehat{\mathbf{x}}$ then lies at the midpoint between allocation $\widetilde{\mathbf{x}}^1$ and the endowment $\mathbf{e}^1$ in the twofold replica economy, but approaches allocation $\widetilde{\mathbf{x}}^1$ as r increases.
- Page 477. Appendix B. First paragraph.
  - Third line of Appendix B needs a space after $r'(K) > 0$.
  - Fourth line of Appendix B needs a full stop, so it should read "...demand, $g'(p) < 0$. Total cost is then..."
- Page 478.
  - Line 3 (end of first paragraph) should read "...and $B \equiv 1 + (1/s_{L,w})$."
  - First displayed equation should read

$$s_{K,r} = \frac{-A\left[\theta_K \varepsilon_{q,p} + \sigma\left(\varepsilon_{q,p}/s_{L,w}\right)A + \sigma\theta_L B\right]}{\left(\theta_K + \theta_L B\right)^2 + \theta_K\left(\sigma/s_{L,w}\right)A + \theta_L\left(\varepsilon_{q,p}/s_{L,w}\right)AB}$$

  - Line 9 should read "... substitution between inputs σ; (2) the price-elasticity..."
  - Line 15 should read "which still assumes that..."
  - Line 18 (in the section of Marshall's Presentation) should read "...every firm i, which implies that $A = B = 1$, and that $\sigma = 0$, we can simplify the expression of $s_{K,r}$ to

$$s_{K,r} = -\frac{\theta_K \varepsilon_{q,p}}{\left(\theta_K + \theta_L\right)^2 + \theta_L\left(\varepsilon_{q,p}/s_{L,w}\right)}.$$

    Multiplying numerator and denominator by $s_{L,w}$, and noticing that $\theta_K + \theta_L = 1$ by definition, we obtain

$$s_{K,r} = -\frac{\theta_K \varepsilon_{q,p} s_{L,w}}{s_{L,w} + \theta_L \varepsilon_{q,p}}.$$

    Hence, the derivatives testing..."
- Page 479.
  - The first displayed equation should be partial derivative with respect to θ_K, rather than $\varepsilon_{q,p}$, so it should read $\frac{\partial s_{K,r}}{\partial \theta_K}$ on the left-hand side.
  - The first paragraph should end with "...is still decreasing in $\varepsilon_{q,p}$ and in $s_{L,w}$, but not necessarily in θ_K."
  - Line 5 should read "$\varepsilon^i_{q,p} = s^i_{L,w} = \infty$, but he does not impose conditions on σ about the substitutability of inputs. In this context, $s_{K,r}$ becomes

$$s_{K,r} = \frac{-\left[\theta_K \varepsilon_{q,p} + \sigma\left(\varepsilon_{q,p}/s_{L,w}\right) + \sigma\theta_L\right]}{\left(\theta_K + \theta_L\right)^2 + \theta_K\left(\sigma/s_{L,w}\right) + \theta_L\left(\varepsilon_{q,p}/s_{L,w}\right)}$$

    Multiplying numerator and denominator by $s_{L,w}$, and noticing that $\theta_K + \theta_L = 1$ by definition, we obtain

$$s_{K,r} = \frac{-\left[\theta_K \varepsilon_{q,p} s_{L,w} + \sigma\left(\varepsilon_{q,p} + \theta_L s_{L,w}\right)\right]}{s_{L,w} + \theta_K \sigma + \theta_L \varepsilon_{q,p}}$$

    Differentiating with respect to..."

– The fifth displayed equation, with $\frac{\partial s_{K,r}}{\partial \theta_K}$, should read

$$\frac{\partial s_{K,r}}{\partial \theta_K} = -\frac{\varepsilon_{q,p}\left(s_{L,w}^2 - \sigma^2\right) + \theta_L s_{L,w}\left(\varepsilon_{q,p}^2 - \sigma^2\right)}{\left[s_{L,w} + \theta_K \sigma + \theta_L \varepsilon_{q,p}\right]^2},$$

- Page 481.
  - Exercise 3, part (b) should read "...solves your equality in part (a-i), then..." This should clarify that we are talking about the first section of part (a).
  - Exercise 4. Second line. Add a space between "is" and "$x(p)$"
  - Exercise 4. Third line should read "... aggregate supply curve is $q(p) = \alpha p^{\gamma}$, where..."
  - Exercise 5. Second line after the displayed equation should read "...θ is a positive constant, parameter $\beta \in (0, 1]$ captures the degree of substitutability, and $j \neq i$."
- Page 482. Exercise 9, part (b). The utility function of individual A should have no comma between x^A and y^A, so it should read $u^A(x^A, y^A) = x^A y^A$.
- Page 483. Exercise 12. At the end of the second line, delete the comma between x^B and y^B, so it reads "and $u^B(x^B, y^B) = x^B y^B$ with initial..."
- Page 484.
  - Exercise 15, the line after the first displayed equation has unnecessary spaces. It should read "...the first commodity is a “good” for each consumer, whereas the second commodity is a “bad” for each consumer."
  - Exercise 17. Last line should read "where x_i^A is the consumption of good i by A, where $i = \{1, 2\}$. Consumer A has endowments..."
- Page 485. Exercise 17, part (a) should read "Find the Walrasian demands of consumers A and B."
- Page 486. Exercise 23. The utility function of individual B in the displayed equation has a missing square, so it should read $u^B(x^B, l^B) = \left(x^B\right)^2 l^B$.
- Page 487. Exercise 25, part (b). Add a space between "that" and "p_1", so it reads "...assume that $p_1 = p_2 = 1$."

7. **Chapter 7 - Monopoly**

- Page 492.
  - Fourth line. Terms a and b should be in italics, so it reads "Denoting, for compactness, $a \equiv \alpha/\beta$ and $b \equiv 1/\beta$, we now have..."
  - Figure 7.2. Legend should read "Price and quantity under monopoly (m) and perfect competition ($*$)."
- Page 495. Example 7.1. It should read "In addition, we usually assume that..."
- Page 499.
  - Example 7.2. Third line, should read "demand function $q(p) = Ap^{-b}$, where $-b$ represents..." (the parenthesis around p should not be in italics).
  - Example 7.2. Last displayed equation should read $p^m = \frac{c}{1+(1/\varepsilon_{p,q})} = \frac{c}{1-(1/b)}$, which implies that the monopoly price at the end of the example should read $p^m = \$12$.
- Page 505. Example 7.4. Third displayed equation of the page should have ∂q in the numerator of the second term, rather than ∂c.
- Page 506.
  - First paragraph, second line should read $q^m(c)$ instead of $p^m(c)$.
  - Last sentence of Example 7.4 (immediately above Section 7.5). Add a space between "q^m" and "is".
- Page 508. Example 7.5.

- Third line. Cost function should have j subscripts, so it reads "$TC_j(q_j) = F + cq_j^2$, where $F > 0$ denotes..."
- Fifth line. The sum operator should read $a - 2b\sum_{j=1}^{N} q_j$, so output q_j has a j subscript.

- Page 509.
  - Sentence after the first displayed equation should read "indicating that the optimal number of plants N^* is decreasing in the fixed cost of operating a plant, F, since $\frac{\partial N^*}{\partial F} < 0$ holds for all parameter values; and decreasing in c as long as $\frac{\partial N^*}{\partial c} < 0$, which holds when a satisfies $a < 4\sqrt{cF}$."
  - Example 7.6. Term (q_1, q_2) now to the right-hand side of the max operator should go below this operator, so it reads $\max_{q_1,q_2\geq 0}$.
- Page 514. Example 7.8. After the second displayed equation, it should read "since price $p(q_2)$ depends on the total number of units sold, q_2, whereas the sales in the second block are only $q_2 - q_1$. Hence, the overall profits of the monopolist..."
- Page 517. Line after the first displayed equation (top of the page) should read "Taking the first equation, $q_{i+1} = 2q_i - q_{i-1}$, and begining with..."
- Page 527. First paragraph should read "...that the proportion of low-demand (high-demand) students..."
- Page 528-529. The section "Two-part Tariffs" of Example 7.11 should read, after the first three lines, as follows:
  –

$$F_L = \theta_L\left(q_L - \frac{q_L^2}{2\theta_L}\right) \quad \text{and} \quad F_H = \theta_H\left[\left(q_H - \frac{q_H^2}{2\theta_H}\right) - \left(q_L - \frac{q_L^2}{2\theta_H}\right)\right] + \theta_L\left(q_L - \frac{q_L^2}{2\theta_L}\right)$$

Hence, the monopolist's PMP becomes

$$\max_{q_L,q_H\geq 0} \gamma\left[F_L - cq_L\right] + (1-\gamma)\left[F_H - cq_H\right]$$

$$= \gamma\left[\underbrace{\theta_L\left(q_L - \frac{q_L^2}{2\theta_L}\right)}_{F_L} - cq_L\right] + (1-\gamma)\left[\underbrace{\theta_H\left[\left(q_H - \frac{q_H^2}{2\theta_H}\right) - \left(q_L - \frac{q_L^2}{2\theta_H}\right)\right] + \theta_L\left(q_L - \frac{q_L^2}{2\theta_L}\right)}_{F_H} - cq_H\right]$$

$$= (1-\gamma)\theta_H\left[\left(q_H - \frac{q_H^2}{2\theta_H}\right) - \left(q_L - \frac{q_L^2}{2\theta_H}\right)\right] + \theta_L\left(q_L - \frac{q_L^2}{2\theta_L}\right) - c\gamma q_L - c(1-\gamma)q_H$$

Taking first-order conditions with respect to q_H and q_L yields, respectively,

$$\begin{aligned} -(1-\gamma)\theta_H + (1-\gamma)q_L + \theta_L - q_L - c\gamma &= 0 \\ (1-\gamma)\theta_H - (1-\gamma)q_H - c(1-\gamma) &= 0. \end{aligned}$$

Solving for q_H in the first expression and for q_L in the second, we obtain

$$\begin{aligned} q_H &= \theta_H - c \\ q_L &= \frac{\theta_L}{\gamma} - \frac{(1-\gamma)}{\gamma}\theta_H - c \end{aligned}$$

where $q_H > 0$ since $\theta_H > c$ by definition, and $q_L > 0$ holds if $\theta_L > (1-\gamma)\theta_H + \gamma c$, i.e., when low demand is not extremely weak. Socially optimal outputs can be found by setting marginal utility equal to marginal cost, i.e., $u_i'(q_i) = \theta_i - q_i = c$; which yields $q_i^{SO} = \theta_i - c$ for every type-i customer (that is, $q_H^{SO} = \theta_H - c$ and $q_L^{SO} = \theta_L - c$).
We can then compare the output under the two-part tariff, q_i, against the socially optimal output, q_i^{SO}, obtaining that $q_H = q_H^{SO}$ for the high-demand customer. For the low-demand customer, however, we find that $q_L < q_L^{SO}$, since

$$\frac{\theta_L}{\gamma} - \frac{(1-\gamma)}{\gamma}\theta_H - c < \theta_L - c$$

which simplifies to $\gamma(\theta_H - \theta_L) < (\theta_H - \theta_L)$, or $\gamma < 1$, which holds by definition. The monopolist can obtain larger profits by practicing second-degree price discrimination (two-part tariffs) than by setting a uniform price (either to attract both or only one type of customer). Using the same parameter values as under uniform pricing, $\theta_H = 5$, $\theta_L = 2$, $c = 1$, and $\gamma = 3/4$, we obtain output levels $q_H = 4$, $q_L = 1$, and fees $F_H = \$9$, and $F_L = 3/2$. As a consequence, expected profits from two-part tariffs are

$$\pi^{TPT} = \gamma[F_L - cq_L] + (1-\gamma)[F_H - cq_H] = \frac{31}{8} \simeq 3.87.$$

In contrast, the profits under uniform pricing become

$$\pi^{Uniform} = \frac{[\gamma\theta_L + (1-\gamma)\theta_H]^2}{4} = \frac{49}{64} \simeq 0.76, \text{ and}$$

$$\pi^{Uniform-H} = (1-\gamma)\frac{(\theta_H - c)^2}{4} = 1.$$

Hence $\pi^{TPT} > \pi^{Uniform-H} > \pi^{Uniform}$, and practicing two-part tariffs is profit enhancing for the monopolist. ■

- Page 531.
  - First paragraph, previous to last line before section 7.8, should not have a minus sign, so it reads "$A/(p \cdot q) = 0.1/1.5 = 0.067$"
  - Footnote 18 should read "total cost function $TC(q) = F + cq^{\alpha}$, where..." and continue "marginal cost is $MC(q) = \alpha c/q^{1+\alpha}$, whereas average cost is $AC(q) = F/q + c/q^{1+\alpha}$, where..."
  - Footnote 19 should read, in its last line "... water distribution and electricity companies."
- Page 539. Example 7.13. Last sentence before the end-of-chapter Exercises, should read "$pf''(x^*) - 2w'(x^*) = p0 - 2b < 0 = w''(x^*)x^*$."
- Page 540. Exercise 3. The first line of the exercise should read "Assume that Pullman Airlines is a monopolist..."
- Page 542. Exercise 6.
  - Fourth line should read "we obtain $p(x^A) = (a/\theta_A) - (1/\theta_A)\,x_A$ and $p(x^B) = (a/\theta_B) - (1/\theta_B)\,x_B$ for Ann and Bob, respectively."
  - Sixth line. Rather than saying that "Ann's willingness to pay for the good is higher than Bob's" it should read "Ann's reservation price is higher than Bob's"
  - Question (d) should read as follows: "What price does it charge, and how many units does it sell to Ann and Bob? Compare your answer with that in part (a)."
- Page 543. Exercise 8. Fourth line should read "blades for the Spanish market"
- Page 544. Exercise 9. First displayed equation (top of page) should not have a negative sign after $c''(A)$.
- Page 545. Exercise 11. Last line before part (a) of the exercise should read "where now λ captures the network effects (as it is the only ratio containing parameter γ). Also assume that marginal costs c are constant and $c < a$."

6. **Chapter 8 - Game Theory and Imperfect Competition**

- Page 550.
  - Fourth line should read "...best response to firm B playing..."
  - Sixth line should read "... and its best response to firm A selecting *Not adopt* (in the bottom row) is..."
  - Definition of Mixed-strategy Nash equilibrium. Second line should read "...for player i. Strategy profile σ is a msNE if and only if"
  - Last paragraph. First line should read: "First, in a msNE, players..."

- Page 551, second paragraph (fourth line). It should read "However, firm B prefers to choose..." rather than "However, firm B's prefers to choose..."
- Page 552.
  - First displayed equation, last line should read "$1 - p = p \Longrightarrow p = \frac{1}{2}$."
  - Second paragraph should read "...implying that firm B adopts the technology with probability $p = \frac{1}{2}$. Combining our results..."
  - Third paragraph (fifth line of the page) should read "where the first term of the parenthesis..."
  - Example 8.1. Ninth line should finish with "between adopting and not adopting solves"
- Page 553, First paragraph, sixth line should read "...implying that firm A prefers not to adopt the technology..."
- Page 558, last paragraph. It should read "when he is called on to move at every subgame" rather than "when he is called to move at every subgame" (that is, "on" should be added).
- Page 563. Subsection 8.1.3. Third line from the bottom should read "$Prob\,(\theta_i = H) = p$ and the probability of its costs being low is $Prob\,(\theta_i = L) = 1 - p$, where..."
- Page 564. Last line of first paragraph should read "...to playing the left-hand (right-hand) matrix."
- Page 566 and 567. Tables 8.6-8.8. The label in the last row of all three tables should be $NI_H NI_L$.
- Page 567. Table 8.8. The payoff for firm A in cell $(I_H NI_L, NI)$, on the right-hand side of the matrix, should be underlined, so it reads $\underline{2\ 1/3}$.
- Page 570.
  - Table 8.9. The probability p should be italized in all cells of the matrix, so it needs to be italized in the top right cell, and in the left cell of the third row.
  - Table 8.9. The second element of the top right cell, $3.5p$, should be underlined with a dashed line.
  - Last displayed equation should read $EU_2(R) = 2\mu + (-3)(1-\mu) = -3 + 5\mu$.
  - The line immediately below the last displayed equation should then read "... since $3.5\mu > -3 + 5\mu$ simplifies to $1.5\mu < 3$, which holds...
  - Last line of the page should read "...the BNE $(N^B N^{NB}, R)$ prescribes..."
- Page 571. First paragraph, second line, should read "rather than using BNE, we can..."
- Page 572. Second paragraph (line eleven of this paragraph) should read "... player 1 is zero, since $\alpha_B = 0$ and $\alpha_{NB} = 0$). This makes..."
- Page 573.
  - Fourth element of the list, third line, should read "...player 1 makes an offer when the..."
  - Example 8.6. The last sentence of the first paragraph in this example should read "but not observing the..." rather than "butnot observing the...".
- Page 575.
  - First displayed equation (top of the page) should read

$$\mu = \frac{\frac{1}{3}\alpha_H}{\frac{1}{3}\alpha_H + \frac{2}{3}\alpha_L} = \frac{\frac{1}{3} \times 1}{\frac{1}{3} \times 1 + \frac{2}{3} \times 0} = 1.$$

  - Second displayed equation (center of the page) should read

$$\gamma = \frac{\frac{1}{3}(1 - \alpha_H)}{\frac{1}{3}(1 - \alpha_H) + \frac{2}{3}(1 - \alpha_L)} = \frac{\frac{1}{3} \times 0}{\frac{1}{3} \times 1 + \frac{2}{3} \times 0} = 0.$$

  - First bullet point (bottom of page), last sentence should read "... a manager (M) in the right-hand side of the tree..."
  - Second bullet point (bottom of age), last sentence should read "... the branch corresponding to C' in the left-hand side of the tree..."

- Page 576.
  - Second bullet point, third line, should read "he deviates towards pursuing more education..."
  - Second bullet point, last line, should read "the worker chooses not to pursue it."
- Page 577.
  - First displayed equation (middle of the page) should read

$$\gamma = \frac{\frac{1}{3}(1-\alpha_H)}{\frac{1}{3}(1-\alpha_H)+\frac{2}{3}(1-\alpha_L)} = \frac{\frac{1}{3}\times 1}{\frac{1}{3}\times 1+\frac{2}{3}\times 1} = \frac{1}{3},$$

  - Second displayed equation (bottom of the page) should read

$$\mu = \frac{\frac{1}{3}\alpha_H}{\frac{1}{3}\alpha_H+\frac{2}{3}\alpha_L} = \frac{\frac{1}{3}\times 0}{\frac{1}{3}\times 0+\frac{2}{3}\times 0} = \frac{0}{0},$$

- Page 581. The last sentence of the first paragraph should read "the price of both firms coincides."
- Page 582. Last paragraph, fourth line should read "firms is where their best-response functions..."
- Page 584. Footnote #16, please remove the adjective "constant" from the second line.
- Page 585.
  - First displayed equation, last part, should read "... or simply $p(q_2^*) \leq c'(0)$."
  - Last paragraph before subsection 8.3.1, fourth line should read "imply that $p(0) \leq c'(0)$, since no firm..."
- Page 586.
  - First paragraph, sixth line should read "for equilibrium output to be profit-maximizing (second-order condition)..."
  - First displayed equation. Last term should read $p''(q)q_i + p'(q) < 0 \;\; \text{for all } k \neq j$."
  - Last paragraph before Example 8.7. Previous to last line should read "as $p''(q)q_i + p'(q) < 0$, which means that firm j's..."
- Page 589. First paragraph, sixth line should read "which is half of $(a-c)/b$, each firm would..."
- Page 591. First paragraph, first line should read "Cournot pricing rule simplifies to $-1/n\varepsilon$. Moreover..."
- Page 594. Paragraph immediately before the last displayed equation should read "Taking first-order conditions with respect to p_i, we obtain $a - 2bp_i + cp_j = 0$; and solving for p_i, we find firm i's best-response function".
- Page 598.
  - First displayed equation should read

$$p_2(p_1) = \begin{cases} p^m & \text{if } \; p_1 > p^m, \\ p_1 - \varepsilon & \text{if } \; p^m \geq p_1 > c, \\ c & \text{if } \; p_1 \leq c. \end{cases}$$

  - The paragraph immediately after the first displayed equation should read "Graphically, this best response function coincides with that found in Section 8.2, and depicted in Figure 8.22. Intuitively, the follower sets monopoly price p^m when the leader charges a price above the monopoly price; undercuts the leader's price p_1 by a small..."
- Page 599. Last displayed equation should read

$$D_1(p_1,p_2) + \left(p_1 - \frac{\partial TC\,(D_1)}{\partial D_1}\right)\left[\frac{\partial D_1(p_1,p_2)}{\partial p_1} + \underbrace{\frac{\partial D_1(p_1,p_2)}{\partial p_2}\frac{\partial p_2(p_1)}{\partial p_1}}_{\text{New}}\right] = 0$$

- Page 603. Fourth displayed equation (last part) should read "...$= \frac{1}{2}(a - q_1 - c)\, q_1$".
- Page 605. Figure 8.31 should have label Q in the horizontal axis, rather than q.
- Page 609.
  - The last sentence of the page should read "The analogous best-response function".
  - Footnote #25, first line, should read "ranking between $p_2 = (a - \overline{q}_1)/2$ and p^*...".
- Page 610.
  - First displayed equation. Please use q rather than Q in the labels below the first term of the equation, since in this section q denotes aggregate output.
  - Last sentence before subsection 8.7.1 should read "linear demand in this section."
  - Last displayed equation, left-hand side should read $\pi'_j(n)$, rather than $\pi'(n)$.
- Page 611. First paragraph, before subsection 8.7.2 should finish with "... which we write as $\pi_j(n^e) = 0$. Figure 8.35 provides a graphical representation of this result."
- Page 612.
  - First displayed equation (top of the page) should read

$$\pi(n) + n\left[p(nq(n)) - c'(q(n))\right]\frac{\partial q(n)}{\partial n} = 0.$$

  - Second paragraph, third line, please delete the sentence "Therefore the entry of..." until "...produces a negative effect on social welfare."
- Page 613.
  - Third displayed equation, the first term should read $p(n)$, rather than $p(n) - c$.
  - Last displayed equation, the third term should read $\left(x - \frac{x^2}{2}\right)\Big|_0^{\frac{n}{n+1}} - nF$, rather than $\left(x - \frac{x}{2}\right)^2\Big|_0^{\frac{n}{n+1}} - nF$.
- Page 614.
  - Second displayed equation. The second term should read $\frac{1}{(n^o+1)^3} - F = 0$, rather than $\frac{1}{(n^o+1)^3} = 0$.
  - Last line before section 8.8 should read "...permits in satellite TV, and radio spectrum for mobile phones."
- Page 615. First line should read "More importantly, we can show that..."
- Page 615. First paragraph of section 8.8.1.
  - Second line should read "...let $p_{j,t}$ denote..."
  - Third line should read "... choices by the two firms, $H_{t-1} = \{p_{1,t}, p_{2,t}\}$ for every period..."
  - Fifth line should read "... Conditioning $p_{j,t}$ into the full history..."
  - Seventh line should read "... price $p_{j,t} = d$ regardless of previous history where $d > 0$; (2) setting a price $p_{j,1}$ in the first round of..."
  - Ninth line should read "...setting a price $p_{j,t}$, where $p_{j,t} < p_{j,1}$, if firm k..."
  - Tenth line should read "... threshold level $p_{k,t} = e$ during any previous period..."
  - Eleventh line should read "... relatively low price $p_{j,1}$ and practice one dollar increments..."
- Page 617, second paragraph (fourth line). Add a space between "namely" and "$p_{j,t} = p^m - \varepsilon$".
- Page 626. Third paragraph (starting with Figure A8.2 gives...) should finish with "...at the horizontal axis where $q_1^* = 0$ and $q_2^* > 0$."
- Page 631. Exercise 7, part (c). The first inequality should read as follows: $u_i(A, A) < u_i(B, A)$.
- Page 632. Exercise 11. Please add "Reynolds and Snapp (1986)" at the end of the title, so the full title now reads "Cournot with equity swaps (Reynolds and Snapp, 1986)" in bold font. The complete reference to this article should be added to the references at the end of the chapter: Reynolds, Robert J., and Bruce R. Snapp (1986) "The competitive effects of partial equity interests and joint ventures." International Journal of Industrial Organization 4, no. 2: 141-153.

- Page 633. Exercise 13. The second paragraph of the question (below the first displayed equation) should read "where $j \neq i$ and parameter θ satisfies $\theta \in [0, 1]$, that is, if..."
- Page 635. Exercise 20 (third line). Add a space between "this" and "two-stage", so it reads "this two-stage".
- Page 636. Exercise 23 (sixth line). The last part of the sentence should read "...and share demand equally." rather than "...and share equally demand."
- Page 636. Exercise 24 should be titled "Cournot competition with exponential inverse demand"
- Page 637. Exercise 26.
  - Part (b), second line should read "... when firm 1 moves first" rather than "...when Firm 1 moves first".
  - Part (c). The last part of the exercise should be completed with: "Answer the following two questions: (i) Solve for the highest K that firm 1 would pay for the first-mover advantage, and label it $\bar{K}$. (ii) *Comparative statics*. Find $\frac{\partial \bar{K}}{\partial c}$ and $\frac{\partial \bar{K}}{\partial a}$. Interpret."
- Page 638, Exercise 30, part (c-i), last line should read "...as found in example 8.15" rather than "...as found in example 8.17".

7. **Chapter 9 - Externalities and Public Goods**

- Page 643.
  - Second paragraph, eighth line should read "In the present setting, assume that $\pi'(x) > 0$ and $\pi''(x) < 0$ for every externality level $x \geq 0$, thus indicating that the marginal benefit..."
  - Last paragraph, sixth line should read "where $v'(x) < 0$ for all $x \geq 0$. For instance, the firm's profits..."
- Page 644.
  - Page 644. The asterisk next to x, x^*, should have the same size throughout pages 644-645.
  - Figure 9.1 should have label x^* next to the crossing point between $\pi'(x)$ and the horizontal axis.
  - Last line should read "...from an additional unit, $\pi'(x)$, is exactly zero."
- Page 645.
  - First paragraph should be replaced for "We remain silent on the UMP of the individual affected by pollution (agent 2) because he cannot affect the level of the externality-generating activity x. In particular, he chooses the bundle of goods in q to maximize his utility $u(q, x)$ subject to $pq \leq w$, where $p \in \mathbb{R}^L_+$ is the given price vector and $q \in \mathbb{R}^L$. Therefore, he does not include pollution as one of the L-tradable goods."
  - The second displayed equation should read

$$\pi'(x^0) + v'(x^0) \leq 0, \quad \text{with equality if } \ x^0 > 0,$$

  - The third displayed equation should read

$$\pi'(x^0) \leq -v'(x^0), \quad \text{or } \ \pi'(x^0) = -v'(x^0) \text{ in the case of interior solutions.}$$

- Page 646. Example 9.1.
  - The second line of the Example should read "where y denotes output, and $y = x/\alpha$, where $\alpha > 0$, thus indicating that every unit of output y..."
  - The paragraph starting with "which is decreasing in x. However, a consumer..." should have x^2 in the equation of the second line, so it reads "... the damage function $v(x) = \beta - cx - (d/2)x^2$, where..."
  - The last line of the page should read "which is decreasing in x. In this context, if the firm..."
- Page 647. Third paragraph should read "...at the vertical intercept of figure 9.2. In this setting,..."

- Page 648. At the end of Example 9.1, add the following sentence: "Therefore, the socially optimal level of the externality is lower than the competitive equilibrium since $x^0 = \frac{a-c}{b+d} < \frac{a}{b} = x^*$ simplifies to $-bc < da$, which holds for all parameter values."
- Page 649. Example 9.2. Last equation of the last line (immediately above Section 9.2) should read r_i^* rather than r_1^*.
- Page 650. The second line after equation (9.1) should read "individual appropriation" rather than "individual approximation".
- Page 651. The last displayed equation should have $\frac{\partial^2 c\left(x_i^*, X_{-i}^*\right)}{\partial x_i \partial x_j}$ in the last term, rather than $\frac{\partial c\left(x_i^*, X_{-i}^*\right)^2}{\partial x_i \partial x_j}$, so the 2 indicating the second-order derivative shows up next to ∂ rather than at the end of the expression.
- Page 652. The sixth line after equation (9.2) should read "a larger appropriation by firm i (i.e., a negative externality on costs)."
- Page 654.
  - The first line should read "Taking FOC with respect to every $x_i \geq 0$ yields"
  - The second displayed equation should read

$$x_i = \frac{a-c}{2b} - \frac{b+c\alpha}{b} x_j$$

  - At the end of the first long paragraph, the last sentence should read "... optimal appropriation is only $x_i^{SO} = 2/17 \simeq 0.12$."
  - Subsection 9.2.2. Third line should read "... policy tools that help companies internalize such external effects for a given number..."
- Page 656. Paragraph after the third displayed equation shoudl read "we obtain a consumer surplus of $CS^* = \frac{N^2}{2(N+1+2\theta)^2}$. As found above,..."
- Page 657. Last line should have "theorem" with a capital T for consistency with other references to Coase Theorem.
- Page 656. Last line should read:
  - "Intuitively, increasing the number of firms, N, increases consumer surplus as a larger output entails lower prices. The difference $\Pi^* - ED^*$ is given by

$$\begin{aligned} \Pi^* - ED^* &= \frac{N(1+\theta)}{(N+1+2\theta)^2} - d\frac{N}{(N+1+2\theta)^2} \\ &= \frac{N(1+\theta) - dN^2}{(N+1+2\theta)^2}. \end{aligned}$$

    Differentiating $\Pi^* - ED^*$ with respect to the number of firms N, we obtain

$$\frac{\partial\left[\Pi^* - ED^*\right]}{\partial N} = \frac{(1+\theta)(1+2\theta-N) - 2dN(1+2\theta)}{(N+1+2\theta)^3}$$

    which is negative when $N \geq 1+2\theta$, i.e., the number of firms is sufficiently large. Since the number of entrants when firms coordinate entry is given by $N^* = 1+2\theta$, we can rewrite the above condition as $N \geq N^*$, indicating that $\Pi^* - ED^*$ decreases when the number of firms exceeds N^*. Therefore, the socially optimal number of firms is given by equating $\frac{\partial CS^*}{\partial N}$ with $\frac{\partial[\Pi^* - ED^*]}{\partial N}$, that is,

$$\frac{N(1+2\theta)}{(N+1+2\theta)^3} = \frac{(1+\theta)(1+2\theta-N) - 2dN(1+2\theta)}{(N+1+2\theta)^3}$$

    which, after rearranging, becomes

$$\overline{N} = \frac{(1+\theta)(1+2\theta)}{(1+\theta) + (1+2\theta)(1+2d)}$$

Hence, for all values of $d > 0$, we obtain that $\overline{N} < N^*$, because

$$\frac{(1+\theta)}{(1+\theta)+(1+2\theta)(1+2d)}(1+2\theta) < 1+2\theta$$

which simplifies to $0 < (1+2\theta)(1+2d)$. This condition always holds since $d > 0$ by definition. As a consequence, $\overline{N} < N^*$ holds for all parameter values. In words, the number of firms that a social planner would choose to maximize social welfare, $\overline{N}$, is lower than the number of firms the industry would choose to maximize aggregate profits (which, in turn, are both lower than the number of firms entering in equilibrium)."

- Page 657. Last line should have "theorem" with a capital T for consistency with other references to Coase Theorem.
- Page 658.
  - Second paragraph. Add space between "pollution" and "in" so it reads "...in exchange of x units of pollution in order to..."
  - Line 12, should read "Given this constraint on the set of acceptable offers, the affected individual (with wealth w_2), chooses the pair (x, T) that solves the following problem"
- Page 660.
  - Figure 9.5. The legend should read "Theorem" with a capital T for consistency with other references to Coase Theorem.
  - Footnote 10, third line should read "the affected individual provides the fee $\$T$ to the firm to reduce pollution..."
- Page 661. Last displayed equation should finish with "$> 2\pi(0)$." instead of "$> 2\pi(x^0)$."
- Page 662.
  - Paragraph immediately below the fourth displayed equation should read "which implies that $\pi(x^*) > \pi(0)$, a condition that holds by definition, since the firm's profits are increasing in x, that is, $\pi'(x) > 0$."
  - Last paragraph, line 10 should read " enforceable (and transaction costs are sufficiently low), the"
- Page 667.
  - Please add a fourth point to the list in this page saying:
  - "4. The tax leads to a socially optimal outcome if it is costless to implement. Otherwise, if tax collection is costly, the government may prefer to set a quota, instead of a tax, if its administrative costs are lower. For more details on transaction costs behind different policies, see Williamson (1986)."
  - Footnote 16 misspelt a reference, so it should read "...in Kolstad's (2011) textbook..."
  - Footnote 17, last line should read "For a discussion on different methods..."
- Page 672.
  - Social Optimum section, the line after the first displayed equation lists the producer surplus $PS(X)$. This expression shows a tax t_2 which should read t.
  - The fourth displayed equation shouldn't have the product $\times$ in the last term, $d \times X^2$, as it now looks weird and could be confused for another X. The last term should then read dX^2.
- Page 673. Displayed equation 9.4 has a 2 missing, so it should read $x_{inc}(t) = \frac{1-2c_{inc}+c_{ent}-t}{3}$.
- Page 674.
  - Second displayed equation should read

$$x_{inc}(t) = \frac{1 + Ac_{ent} - (2+2d)c_{inc}}{2A} \quad \text{and} \quad x_{ent}(t) = \frac{1 - Ac_{ent} + 2dc_{inc}}{2A},$$

  - Second paragraph starting with "We now compare...". The equation in the third line should have a $>$ sign rather than $=$, so it reads "$c_{ent} > ((2+2d)\, c_{inc} - 1)\, /A$".

- Paragraph starting with "Second, the condition that..." Fifth line should read "given that pollution is relatively damaging by definition, i.e., $d > 1/2$ (for a graphical illustration..."
- Sentence immediately before the last displayed equation should read "induces positive output levels from both firms, we only need that firms' costs are relatively close to each other, that is,"

- Page 676. Subsection 9.6.1. Line 6 should read "of type $\eta \in \mathbb{R}_+$ experiences amount...". Similarly, line 7 should read "of type $\theta \in \mathbb{R}_+$ that generates an amount..."
- Page 677.
  - Line 9 should read "$x = \overline{x}$, where $\overline{x} > 0$. Since we are dealing..."
  - Paragraph starting with "In this setting...". Fourth line should read "behave according to continuous cumulative distribution functions..."
- Page 683. Footnote 30, last line, should read "the parameter measuring the consumer's sensitivity to..."
- Page 684. Subsection 9.9. Second paragraph, fourth line should read "that is, he cannot observe the precise realization..."
- Page 685. Fourth line should read "... performs better than the tax."
- Page 686.
  - Minimization problem at the bottom of the page should have no $*$ anywhere. They indicate products, but are unnecessary.
  - Minimization problem at the bottom of the page should have z_j, V_j immediately below the min operator, as the minimization problem at the bottom of page 687.
- Page 687.
  - Second displayed equation should have a + sign (rather than a $-$) between wz_j and $p_V V_j$ in the first term of the Lagrangian.
  - Third displayed equation should read $w = \lambda_j \frac{\partial y_j(p,w)}{\partial z_j}$.
  - Fourth displayed equation should read $p_V = -\mu \frac{\partial a_j(\overline{y}_j, V_j)}{\partial V_j}$.
  - Last paragraph of the page (with the title "Emission fee"). The second line of this paragraph should read: "... we need to set an emission fee on pollution, t_j^*, that coincides with μ, the shadow cost of pollution for society. In order to explictly show..."
  - Last displayed equation of the page should have a $\leq$ sign rather than $=$, so it should read $a_j\left(\overline{y}_j, V_j\right) \leq x_j$.
- Page 688.
  - Second displayed equation should have a + sign (rather than a $-$) between wz_j and $p_V V_j$ in the first term of the Lagrangian.
  - Third displayed equation should read $w = \theta_j \frac{\partial y_j(p,w)}{\partial z_j}$.
  - Last sentence before Subsection 9.10.2 should read "In words, the marginal benefit that society obtains from dedicating more inputs to abatement coincides across firms at the social optimum."
  - Subsection 9.10.2. Fourth line should read "... as captured by d_{kj}, which is, generally, decreasing in the distance between measuring stations. That is, the measurement at station m_k can be..."
- Page 689.
  - First displayed equation should have z_j, V_j below the min operator, so it reads

$$\min_{z_j, V_j} \sum_j \left(wz_j + p_V V_j\right)$$

– Third displayed equation should read

$$\mathcal{L} = \sum_j (wz_j + p_V V_j) + \sum_j \lambda_j \left[\overline{y}_j - y_j(p,w)\right] + \sum_k \mu_k \left(\sum_j d_{kj} a_j \left(\overline{y}_j, V_j\right) - \overline{m}_k \right)$$

– The line immediately after the third displayed equation should read "Taking first-order conditions with respect to z_j yields $w = \sum_j \partial y_j(p,w)/\partial z_j$ for every..."

– The fifth displayed equation should read

$$\begin{aligned} p_V &= -\mu_1 d_{12} \frac{\partial a_2(\overline{y}_2, V_2)}{\partial V_2} - \mu_2 d_{22} \frac{\partial a_2(\overline{y}_2, V_2)}{\partial V_2} \\ &= -\left(\mu_1 d_{12} + \mu_2 d_{22}\right) \frac{\partial a_2(\overline{y}_2, V_2)}{\partial V_2} \end{aligned}$$

– The sentence immediately before the sixth displayed equation (and until the end of the page) should read "In order to set an emission fee to firm 2 in this example, t_2, we thus need

$$-t_2 \frac{\partial a_2(\overline{y}_2, V_2)}{\partial V_2} = -\left(\mu_1 d_{12} + \mu_2 d_{22}\right) \frac{\partial a_2(\overline{y}_2, V_2)}{\partial V_2}$$

and solving for t_2, we have

$$t_2 = \mu_1 d_{12} + \mu_2 d_{22}."$$

- Page 690. Title of Table 9.1 should read "Taxonomy of goods."
- Page 691. Last paragraph:
  – First line should read "one public good g, and L traded private..."
  – Second line should read "from the consumption of g units..."
  – Fourth line should read "public good in the economy, g, is enjoyed..."
- Page 692.
  – First paragraph, fourth line should read "increasing and convex in g. Figure..."
  – First displayed equation should have $g \geq 0$, rather than $x \geq 0$, below the max operator.
- Page 693. Example 9.5. Fourth line of this example should read "...cost of producing the public good is cg, where $c > 0$, then the Pareto..."
- Page 694.
  – Last lines of the paragraph before second displayed equation should read "...acquiring g_i units of the public good. Taking first-order conditions with respect to g_i, we obtain"
  – Last paragraph of the page should read "...his purchases of the public good g_i until the point in which the marginal benefit..."
- Page 696. First paragraph, last line should read "is not vertical, i.e., $c'(g) \neq \infty$."
- Page 699. The last line of the page should read "consider a Cobb-Douglas utility function $u_i\left(x_i, G\right) = x_i^{\alpha} G^{1-\alpha}$, where x_i denotes the private good...
- Page 700. The last displayed equation should read as follows

$$G^* = g_1^* + g_2^* = \frac{(1-\alpha)(w_1 + w_2)}{1+\alpha}.$$

- Page 701.
  – Third displayed equation should have 1 as a subscript rather than i, so it reads

$$dG^* = dg_1^* + dg_2^* = dw_1 + dw_2$$

  – Fourth displayed equation should read

$$g_i(G_{-i}) = \begin{cases} (1-\alpha)w - \alpha G_{-i} & \text{if } G_{-i} < \frac{1-\alpha}{\alpha} w \\ 0 & \text{otherwise,} \end{cases}$$

- Example 9.7. Second paragraph should read "denotes total contributions from all individuals except i. Invoking symmetry..."

- Page 702.
  - Second displayed equation should read as follows

$$\begin{aligned}\frac{\partial G^*}{\partial N} &= (1-\alpha)w\frac{1+\alpha(N-1)-\alpha N}{\left[1+\alpha(N-1)\right]^2} \\ &= \frac{(1-\alpha)^2 w}{\left[1+\alpha(N-1)\right]^2}.\end{aligned}$$

  - Section 9.14. Sixth line should read "functions $v_i(g_i+g_j)$ and $v_j(g_i+g_j)$, respectively, where g_i denotes the amount of the public good purchased by consumer $i \in \{1,2\}$. Similarly to our analysis of externalities,..."

- Page 704. First line after the displayed equation should read "Using the market-clearing condition $\widetilde{g} = \widetilde{g}_i + \widetilde{g}_j$, and the fact that..."

- Page 705.
  - Second displayed equation should read

$$\sum_{i=1}^{I} p_i^{**} - c'\left(g^{**}\right) \leq 0, \quad \text{with equality if } g^{**} > 0,$$

  - Paragraph starting with "Intuitively, these markets..." makes use of "her" in lines 2 and 3 of the paragraph. Change to "his" both times.
  - Example 9.8. Third line should read "There is an argument, however, over how much..."

- Page 706.
  - Fifth displayed equation should have m_i rather than α_i, so it reads

$$p_i G = \frac{m_i}{1+m_i}$$

  - The sentence after the fifth displayed equation should read "which is increasing in each individual's benefit..."
  - Sixth displayed equation should have the following last term $= G = \frac{m_E}{1+m_E} + \frac{m_C}{1+m_C} + \frac{m_M}{1+m_M}$.
  - The next line (at the bottom of the page) should read "since $p_E + p_C + p_M = 1$ by definition. We can..."

- Page 707.
  - Section 9.16. First paragraph, last line should read "by other individuals G_{-i} as in the case of negative externalities."
  - The second displayed equation (maximization problem at the center of the page) should have $g_1, ..., g_N$ below the max operator, rather than the current $x_1, ..., x_N$. This equation should also have a v_i rather than v.
  - The third displayed equation should read

$$\frac{\partial v_i(g_i, G_{-i})}{\partial g_i} + \sum_{j \neq i} \frac{\partial v_j(g_i, G_{-i})}{\partial G_{-i}} \frac{\partial G_{-i}}{\partial g_j} - \frac{\partial C(G)}{\partial g_i} \leq 0 \quad \text{for all } i,$$

    Since $G_{-i} = g_1 + ... + g_{i-1} + g_{i+1} + ... + g_N$, we obtain that $\frac{\partial G_{-i}}{\partial g_j} = 1$, which simplifies the above expression to

$$\frac{\partial v_i(g_i, G_{-i})}{\partial g_i} + \sum_{j \neq i} \frac{\partial v_j(g_i, G_{-i})}{\partial G_{-i}} - \frac{\partial C(G)}{\partial g_i} \leq 0,$$

    which in the case of interior solutions..."

- The last two displayed equations should have ∂G_{-i} in the denominator of the second term (left-hand side) rather than the current ∂g_j.
- The last displayed equation of the page should have an $i = 1$ below the first sum operator, rather than the current $j = 1$.

- Page 708. First paragraph. Fourth line should read "(More precisely, $\sum_{j \neq i} \partial v_j(g_i, G_{-i})/\partial G_{-i}$ indicates how all individuals $j \neq i$ are affected by a marginal increase in G_{-i}, whereas the aggregation $\sum_{i=1}^{N} \sum_{j \neq i} \partial v_j(g_i, G_{-i})/\partial G_{-i}$ measures this effect when the consumption of..."
- Page 709. Line 12 should read "...a transfer from individual 2 to 1, namely, $dw_1 > 0$ and $dw_2 < 0$, where..."
- Page 710.
  - Last displayed equation should read

$$\begin{aligned} da &= c\left[\alpha_1 dw_1 + \alpha_2\left(-dw_2\right)\right] = c(\alpha_1 dw_1 - \alpha_2 dw_2) \\ &= c(\alpha_1 dw_1 - \alpha_2 dw_1) = c(\alpha_1 - \alpha_2) dw_1, \end{aligned}$$

  - Last paragraph, first line, should add a space between "that" and "$dG \geq 0$" so it reads "that $dG \geq 0$ only holds..."
  - Last paragraph, second line should read "transfer from individual 2 to 1 is not necessarily neutral, as it can increase..."
- Page 711. Example 9.9. The first and second displayed equation should have a log operator in front of them (that is, in front of u_i in the left-hand side of the equation).
- Page 712. Title of Table 9.2 should read "Payoff matrix under no social preferences", and the title of Table 9.3 should read "Payoff matrix under social preferences".
- Page 713.
  - First line should read "prefers to not contribute if $c - \alpha_i(b-c) \leq d$, which holds given that..."
  - Second line should read "Hence, if parameter β_i satisfies $\beta_i \leq (b-a)/(b-c)$, NC becomes..."
- Page 717.
  - The last two sentences of bullet point 1 should read "concerns about status are $\alpha_i > 0$ and $\alpha_j = 0$. Hence, $g_i^{Sm} = 1$if and only if $\alpha_i > 0$ and $\alpha_j = 0$."
  - The last part of bullet point 2 should read "which is when $\alpha_i = 0$ and $\alpha_j > 0$."
- Page 718.
  - First displayed equation should read, in its third line, as follows "1 if $\alpha_i = 0$ and $\alpha_j > 0$,"
  - Last paragraph before the Appendix makes reference to G^{sm} in the first, third, and fifth lines, but they should be replaced for G^{Sm} in all three cases.
  - Last lines before the Appendix should read "without status concerns). Therefore, relative to the setting where players do not care about status, an increase in the status concerns of only one individual does not raise total contributions. Finally,..."
- Page 719.
  - Second paragraph, third line should read "the firm report coincides with..."
  - Last line of the page should read "the right-hand side of figure A9.1, illustrating a deviation..."
  - Footnote 48. Fourth line should read "requiring the firm to compensate him with c dollars, but paying"
- Page 720. Second paragraph, third line should read "leading the regulator not to allow..."
- Page 728, Exercise 9. Third line should read "... how many dollars to contribute to a public good whose price is normalized to \$1. Assume that each individual i has wealth, $\omega_i \geq 0$, and a Cobb-Douglas utility function..."
- Page 729. Exercise 11. Last line before part (a) should read "...same wealth, $M \geq 1$, and that the price for both goods is 1."

- Page 730. Exercise 13. Line immediately after the two displayed equations should read "linear in wealth, w." rather than "linear in money, w."

8. **Chapter 10 - Contract Theory**

- Page 737. The PC equation should not have brackets, so it reads

$$\text{"subject to } \sum_{i=1}^{N} f(\pi_i|e)\, u(w(\pi_i)) - g(e) \geq \overline{u}\text{"}$$

- Page 738. The sentence before displayed equation (10.1) should read "and solving for λ yields" (that is, add a space between "for" and "λ").
- Page 739. Case 1, third line should read "Hence the FOC in expression (10.1) becomes"
- Page 740.
  - Line 1 should read "the first-order condition in (10.2) entails..."
  - Line 6 should add a space between "w^*" and "regardless" so it now reads "w^* regardless of".
- Page 741.
  - First displayed equation should have ∂g rather than ∂e on the denominator.
  - First line immediately below equation (10.3) should read "at which its marginal expected profit". The second line of that paragraph should read "(on the right-hand side)"
- Page 742.
  - First line should replace the equation number (3) with (10.3), for consistency, reading "...whether the FOC in expression (10.3) identifies..."
  - First to the third displayed equation should read:

$$\sum_{i=1}^{N} f''(\pi_i|e) \cdot \pi_i - \frac{g''(e)\, u'(\overline{u} + g(e)) - [g'(e)]^2\, u''(\overline{u} + g(e))}{[u'(\overline{u} + g(e))]^2} \leq 0.$$

    Rearranging terms, we obtain

$$\sum_{i=1}^{N} f''(\pi_i|e) \cdot \pi_i - \frac{g''(e)}{u'(\overline{u} + g(e))} + \frac{[g'(e)]^2\, u''(\overline{u} + g(e))}{[u'(\overline{u} + g(e))]^2} \leq 0.\text{"}$$

  - Case 2 (bottom of page). Third line should read "is linear in w, that is, $u(w - g(e)) = w - g(e)$. In this context..."
- Page 743.
  - Fourth line should read "The agent's salary is hence $w(\pi_i) = \pi_i - K$, where..."
  - After the second displayed equation, the sentence should read: "where K is independent of the profit realization, entailing that $\sum_{i=1}^{N} f(\pi_i|e)\, K = K$. In this context, the principal's expected profit is"
  - Third displayed equation should read

$$\sum_{i=1}^{N} f(\pi_i|e)\, B(\pi_i - w(\pi_i)) = \sum_{i=1}^{N} f(\pi_i|e)\, B(\pi_i - (\pi_i - K)) = \sum_{i=1}^{N} f(\pi_i|e)\, B(K) = B(K)$$

  - Fourth displayed equation should read

$$\max_{e \geq 0} B(K) = B\left(\sum_{i=1}^{N} f(\pi_i|e)\, \pi_i - \overline{u} - g(e)\right).$$

– Fifth displayed equation should read

$$B'\left(\sum_{i=1}^{N} f'\left(\pi_i|e\right)\pi_i - g'(e)\right) = 0$$

which collapses to

$$\sum_{i=1}^{N} f'\left(\pi_i|e\right)\pi_i = g'(e)$$

since $B' > 0$. That is, effort is increased until the point where the marginal expected profit ..."

- Page 744.
  - Line 8 (paragraph immediately after equation 10.5) should read "we can differentiate (10.4) with respect to π_i in order to apply..."
  - The displayed equation immediately above (10.6) should read

$$w'(\pi_i) = \frac{B''}{B'' + \frac{u''}{u'}B'}.$$

- Page 745.
  - First bullet point (*Risk neutral principal*). The third line should read "$r_A > 0$" rather than "$r_A \geq 0$"
  - Second bullet point (*Risk neutral agent*). The text refers to equation (10.4), but it should read (10.6). In addition, the end of the second line should read "$r_P > 0$" rather than "$r_P \geq 0$".
  - Third bullet point (*Agent is more risk averse than principal*). The text refers to equation (10.4), but it should read (10.6).
- Page 746.
  - Fourth bullet point (top of the page) should read "If $r_P > r_A > 0$, the opposite argument applies..." and continue with "In this case, the less risk-averse individual (the agent) bears less risk than the principal."
  - Section 10.1.4, second sentence should read "rather than slacking"
- Page 748. Third line after the displayed equation should read "is increasing in w)," so we add a space between "in" and "w".
- Page 749.
  - Third line of Section 10.1.5 should read "decreases in π)," so we add a space between "in" and "π".
  - Fifth line of Section 10.1.5 should read "This property is..." rather than "This probability is..."
- Page 750. Add the following footnote at the end of the first paragraph (before the maximization problem): "The conditional probabilities of Examples 10.1 and 10.2 also satisfy the MLRP since the likelihood ratio $\frac{f(\pi|e_L)}{f(\pi|e_H)}$ starts at $\frac{f(\pi_1|e_L)}{f(\pi_1|e_H)} = \frac{0.6}{0.1} = 6$ when evaluated at the lowest profit realization, π_1; decreases to $\frac{f(\pi_2|e_L)}{f(\pi_2|e_H)} = \frac{0.3}{0.3} = 1$ when evaluated at a higher profit realization π_2; and further decreases to $\frac{f(\pi_3|e_L)}{f(\pi_3|e_H)} = \frac{0.1}{0.6} = 0.16$ when evaluated at the highest profit realization π_3."
- Page 751.
  - Second sentence should read "Plugging these values into (10.10) and..." rather than "After plugging these values into (10.10) and..."
  - Fourth displayed equation (this is the displayed equation after equation 10.11) should read

$$\sqrt{w(\pi_3)} = 10 + \sqrt{w(\pi_1)}.$$

- Fifth displayed equation should read

$$\sqrt{w(\pi_2)} = 26.67 - 2.33\sqrt{w(\pi_1)}$$

- Sixth displayed equation should read

$$w(\pi_1) = \$29.53, \quad w(\pi_2) = \$196.17, \text{ and } \quad w(\pi_3) = \$238.21.$$

- Seventh displayed equation should read

$$270 - [0.1 \cdot 29.53 + 0.3 \cdot 196.17 + 0.6 \cdot 238.21] = \$65.27$$

- Page 753.
  - Fifth displayed equation (previous to last displayed equation) should add the following term at the end, right before the "= 0."

$$-\lambda \left[\sum_{i=1}^{N} f'(\pi_i|e)\, u\left(w(\pi_i) - g'(e)\right) \right]$$

  - Sixth displayed equation (last displayed equation of the page) should add the following term at the end.

$$+\lambda \left[\sum_{i=1}^{N} f'(\pi_i|e)\, u\left(w(\pi_i) - g'(e)\right) \right]$$

- Page 754. Figure 10.6. The label on the vertical axis should read $\lambda + \mu \frac{f'(\pi|e)}{f(\pi|e)}$, rather than the current $\lambda + \mu \left[1 - \frac{f'(\pi|e)}{f(\pi|e)}\right]$.
- Page 756.
  - Second displayed equation should add the following term on the right-hand side (right before the end).

$$+\lambda \left[\sum_{i=1}^{N} \left[f_H(\pi_i) - f_L(\pi_i)\right] u\left(w(\pi_i)\right) - g'(e) \right]$$

  - Line 13, after the fourth displayed equation, should read "The agent's reservation utility is $\overline{u} = \frac{1}{2}$. The principal offers..."
- Page 757.
  - First displayed equation. Eliminate expectation operator E on the left-hand side of the equation, so it reads $u(w, e) = ...$
  - Second line after the first displayed equation should read "given that $E[w] = a + be$, $Var[w] = b^2\sigma^2$,[2] and $c(e) = \frac{1}{2}e^2$. Taking..."
  - Fifth displayed equation, labeled as (PC) should read "subject to $a + be - \frac{1}{2}\rho b^2\sigma^2 - \frac{1}{2}e^2 \geq \frac{1}{2}$ (PC)"
  - Line 7, should read "... to a more compact expression, $a + \frac{1}{2}b^2\left(1 - \rho\sigma^2\right) \geq \frac{1}{2}$, which yields a problem..."
  - Eight displayed equation, labeled as (PC), close to the bottom of the page, should read "subject to $a + \frac{1}{2}b^2\left(1 - \rho\sigma^2\right) \geq \frac{1}{2}$ (PC)"
  - Last displayed equation should read $L = (1 - b)\, b - a + \lambda\left[a + \frac{1}{2}b^2\left(1 - \rho\sigma^2\right) - \frac{1}{2}\right]$.
- Page 758.
  - First line should read "first-order conditions" rather than "Kuhn-Tucker conditions".
  - Third displayed equation, labeled as (10.15) should read $\frac{\partial \mathcal{L}}{\partial \lambda} = a + \frac{1}{2}b^2\left(1 - \rho\sigma^2\right) - \frac{1}{2} = 0$.
  - Fifth displayed equation should read $a + \frac{1 - \rho\sigma^2}{2(1+\rho\sigma^2)^2} = \frac{1}{2}$.

[2] The variance of the wage, $Var[w]$, is given by $Var[w] = Var[a + bx]$, which can be rewritten as $Var[a] + Var[bx] + Cov[a, bx]$, simplying to $b^2 Var[x]$. Since $x = e + \varepsilon$, its variance is $Var[x] = \sigma^2$, entailing that $Var[w] = b^2\sigma^2$.

- Sixth displayed equation should read $a = \frac{1}{2}\left[1 - \frac{1-\rho\sigma^2}{(1+\rho\sigma^2)^2}\right]$.
- Seventh displayed equation should read "

$$b = \frac{1}{1+\rho 0} = 1 \text{ and } a = \frac{1}{2}\left[1 - \frac{1-\rho\times 0}{(1+\rho\times 0)^2}\right] = 0.$$

- Line 12 should read "Intuitively, the principal does not offer a fixed payment, and the agent is benefited from high-powered incentives, ..."
- Eight displayed equation, at the bottom of the page, should read as follows

$$b = \frac{1}{1+\rho} \text{ and } a = \frac{1}{2}\left[1 - \frac{1-\rho}{(1+\rho)^2}\right] = \frac{p\,(p+3)}{2\,(1+\rho)^2}.$$

- Page 759.
  - The first paragraph should be replaced with the following "When the agent becomes more risk averse (ρ increases), he receives a higher fixed payment but a lower bonus, since

$$\frac{\partial b}{\partial \rho} = -\frac{1}{(1+\rho)^2} < 0$$
$$\frac{\partial a}{\partial \rho} = \frac{3-\rho}{(1+\rho)^3} > 0$$

    In addition, differentiating the fixed payment, $a = \frac{1}{2}\left[1 - \frac{1-\rho\sigma^2}{(1+\rho\sigma^2)^2}\right]$, with respect to σ^2, we obtain that

$$\begin{aligned}\frac{\partial a}{\partial \sigma^2} &= -\frac{-\rho\left(1+\rho\sigma^2\right)^2 - 2\rho\left(1+\rho\sigma^2\right)\left(1-\rho\sigma^2\right)}{2\left(1+\rho\sigma^2\right)^4} \\ &= \frac{\rho\left(1+\rho\sigma^2+2-2\rho\sigma^2\right)}{2\left(1+\rho\sigma^2\right)^3} \\ &= \frac{\rho\left(3-\rho\sigma^2\right)}{2\left(1+\rho\sigma^2\right)^3}\end{aligned}$$

    which is positive as long as $\rho\sigma^2 < 3$, and is satisfied when $\sigma^2, \rho \leq 1$. In this context, when the outcome becomes more volatile (higher σ^2), the fixed payment a increases. Differentiating $b = \frac{1}{1+\rho\sigma^2}$ with respect to σ^2, we obtain

$$\frac{\partial b}{\partial \sigma^2} = -\frac{\rho}{\left(1+\rho\sigma^2\right)^2} < 0$$

    which is unambiguously negative, so that when the outcome becomes more volatile, the bonus b decreases. In summary, the agent receives high-powered incentives when σ^2 is low (low a and high b), and low-powered incentives when σ^2 is high (high a and low b)."
  - First displayed equation should read

$$\frac{1}{u'(w)} = \lambda + \mu\left[1 - \frac{f\,(\pi, s|e_L)}{f\,(\pi, s|e_H)}\right].$$

  - Four lines to the bottom of the page, it should read "if salary increases in the signal, $w(\pi, s_2) > w(\pi, s_1)$", that is, delete a vertical bar inside the parenthesis.
  - Last displayed equation should read

$$\lambda + \mu\left[1 - \frac{f\,(\pi, s_2|e_L)}{f\,(\pi, s_2|e_H)}\right] > \lambda + \mu\left[1 - \frac{f\,(\pi, s_1|e_L)}{f\,(\pi, s_1|e_H)}\right]$$

- Page 760. Figure 10.7.
  - The label on the top of the vertical axis should read $\lambda + \mu\left[1 - \frac{f(\pi,s_2|e_L)}{f(\pi,s_2|e_H)}\right]$, rather than the current $\gamma + \mu\left[1 - \frac{f(\pi,s_2|e_L)}{f(\pi,s_2|e_H)}\right]$.
  - The label on the middle height of the vertical axis should read $\lambda + \mu\left[1 - \frac{f(\pi,s_1|e_L)}{f(\pi,s_1|e_H)}\right]$, rather than the current $\gamma + \mu\left[1 - \frac{f(\pi,s_1|e_L)}{f(\pi,s_1|e_H)}\right]$.
  - The label on the top, right-hand side of the figure, next to the curve, should read $\frac{1}{u'(w)}$, rather than the current $\frac{1}{v'(w)}$.
- Page 761. First line, there is a missing comma, so it should read "under symmetric information, markets often work..."
- Page 762.
  - Second displayed equation should have a q rather than a p in the numerator, so it reads
$$\max_{p \geq 0} p - \frac{q}{Q}$$
  - Last line should read "... yielding a profit of $Q/2 - q/Q$ for the seller,..."
  - Footnote 7 should not have a square, so it should read "then the buyer's expected value is $(3/2)/2 = 3/4$, and cutoff..."
- Page 763. Subsection 10.4.3, fifth line, should read "namely those with $q \leq Q^2/2$. In that case, the buyer..."
- Page 764.
  - Figure 10.9. Delete the label $E\left[q|q \leq \frac{Q^2}{2}\right] = \frac{Q^2}{4}$. It is unnecessary, and its location relative to other cutoffs in this figure is wrong.
  - Second line of the page should read "...note that $Q^2/4 < Q^3/4 < Q^2/2$ given that $Q \in (1,2)$..."
- Page 767. Previous to last line should read "$c'(e_i,\theta_i)/u'(w_i)$, which is increasing..."
- Page 768. Example 10.6.
  - Third line should read "$\theta_L = 1$, $\theta_H = 2$, productivity of effort is $x(e) = \log(e)$, and..."
  - Fourth line should read "$c(e,\theta_i) = \theta_i e^2$, implying that the marginal cost..."
  - First displayed equation has missing i subscript next to e, so it should read
$$x'(e_i) = \frac{c'(e_i,\theta_i)}{u'(w)} \Longrightarrow \frac{1}{e_i} = \frac{2\theta_i e_i}{1},$$
  - Last line should read "...and $c(e_i,\theta_i) = \theta_i e_i^2$, we obtain a salary..."
- Page 769. First line of subsection 10.5.2 should read "When the firm cannot observe the worker's type (but knows that the probability of high types is p and that of low types is $1-p$), it seeks to maximize the expected..."
- Page 770. Displayed equation that starts with $\frac{\partial \mathcal{L}}{\partial e_L}$ (third equation in the last set of first-order conditions) should read
$$\frac{\partial \mathcal{L}}{\partial e_L} = px'(e_L) + \lambda_2 c'(e_L,\theta_H) - \lambda_3 c'(e_L,\theta_L) = 0,$$
- Page 772. First displayed equation should have a parenthesis in its last numerator, so it reads "$\frac{(1-p)x'(e_H)}{c'(e_H)}$"
- Page 773.
  - First displayed equation should read as follows (there is a typo in one denominator)
$$(1-p)x'(e_H) - \left[\frac{p}{u'(w_L)} + \frac{1-p}{u'(w_H)}\right]\theta_H c'(e_H) + \frac{p}{u'(w_L)}\theta_L c'(e_H) = 0,$$

  - The sentence before the third displayed equation should read "the first term in the equation is positive since $\theta_H - \theta_L > 0$,"
  - The last four displayed equations at the bottom of the page should be numbered (10.16) to (10.19).
- Page 774. The sentence after the first displayed equation should read "of effort satisfying $c(e_H, \theta_L) < c(e_H, \theta_H)$, and the third inequality..."
- Page 775. Example 10.7. Third line should read "Taking the list of FOCs (10.16)-(10.19) from above, we have"
- Page 776. The inequality at the end of the first paragraph should read $0.333 < 0.5$.
- Page 777. First line of section 10.6 should read "observe some characteristics of the regulated firm..."
- Page 779. Section 10.6.2, end of second line. Add a space between "probabilities" and "p".
- Page 780.
  - Last sentence of the first paragraph should read "lump-sum price of F_K where $K = \{L, H\}$, which the consumer..."
  - Sentence immediately before the displayed equation at the center of the page should read "In this program, PC_L does not bind (and thus becomes redundant), as it is implied by the IC_L. Indeed"
  - Displayed equation at the center of the page should read

$$F_L + S_L - C - c_L q_L \geq F_H + S_H - C - c_L q_H > F_H + S_H - C - c_H q_H \geq 0$$

  - The sentence immediately after the displayed equation at the center of the page should read "The first inequality holds by IC_L, and the second is obvious..."
- Page 781. In the paragraph immediately before the third displayed equation, we currently write "... From condition (10.16), $\lambda_4 = \lambda_2 - \lambda_3$, allowing us to rewrite condition (10.17) as ..." and it should read "... From condition (10.16), $\lambda_4 = \lambda_2 - \lambda_3$, we can rewrite condition (10.17) as ..."
- Page 782.
  - The third line of the first (big) displayed equation has a typo (probability q should be p, at the center of the equation).
  - A similar comment applies to the second displayed equation (previous to last equation of the page). Probability q which should be a p.
  - The last displayed equation should read, in its right-hand side, $(\lambda_3 + pg)\frac{c_H - c_L}{(1-p)(1+g)}$, rather than the current $(\lambda_3 + gp)\frac{c_H - c_L}{(1-p)(1+g)}$, for consistency with our previous presentation.
- Page 783.
  - Sixth line (paragraph immediately after the first displayed equation) should read "...which in turn yields $u'(q_H) = u'(q_L)$, and this ultimately gives us"
  - Fourth displayed equation now reads $[\lambda_3 + pg]$ in the right-hand side, but it should have a parenthesis rather than a bracket, so it should read $(\lambda_3 + pg)$ for consistency in our previous presentation.
- Page 784.
  - Figure 10.14. Probability q in the labels on the vertical axis should read p, so the highest label on the vertical axis reads $c_H + gp\frac{c_H - c_L}{(1-p)(1+g)}$.
  - First displayed equation should read

$$S_L = C + c_L q_L - F_L + F_H + S_H - C - c_L q_H.$$

  - Second displayed equation should read

$$\begin{aligned} S_L &= (F_H - F_L) - c_L(q_H - q_L) + (C + c_H q_H - F_H) \\ &= -F_L - c_L(q_H - q_L) + C + c_H q_H \end{aligned}$$

- Third displayed equation should read

$$-u(q_L) - c_L(q_H - q_L) + C + c_H q_H$$

- Third line from the bottom should read "its profits were zero under symmetric information."

- Page 785.
  - Example 10.8 should be replaced with the following: "**Example 10.8. Monopoly regulation.** Consider a utility function $u(q) = \sqrt{q}$ and cost function $C_i(q) = C + c_i q$, where c_i denotes the marginal cost of firm $i = \{L, H\}$ and $c_L < c_H$. Since $u'(q) = \frac{1}{2\sqrt{q}}$, the output of the low-cost firm, q_L, solves $\frac{1}{2\sqrt{q_L}} = c_L$, which we rearrange to yield $q_L = \frac{1}{4c_L^2}$. Similarly, the output of the high-cost firm solves

$$\frac{1}{2\sqrt{q_H}} = \frac{(1+g-p)c_H - pgc_L}{(1-p)(1+g)}$$

which we can rearrange to yield

$$q_H = \frac{(1-p)^2(1+g)^2}{4\left[(1+g-p)c_H - pgc_L\right]^2}$$

As an illustration, consider $C = \frac{1}{4}$, $c_H = \frac{1}{8}$, $c_L = \frac{1}{16}$, $g = \frac{1}{24}$, and $p = \frac{1}{2}$. Inserting these parameter values into our above results, we find that the low-cost firm produces the same amount under symmetric and asymmetric information,

$$q_L^{AI} = \frac{1}{4 \times \frac{1}{16^2}} = 64 = q_L^{SI}$$

whereas the high-cost firm produces a lower output under asymmetric information because

$$q_H^{AI} = \frac{\left(1-\frac{1}{2}\right)^2\left(1+\frac{1}{24}\right)^2}{4\left[\left(1+\frac{1}{24}-\frac{1}{2}\right)\frac{1}{8} - \frac{1}{2}\times\frac{1}{24}\times\frac{1}{16}\right]^2} = \left(\frac{200}{51}\right)^2 \simeq 15.38 < 16 = q_H^{SI}.$$

as depicted in figure 10.14. ■"

- Page 786.
  - Exercise 1. The probability matrix read outcomes $x = 0$ and $x = 1$ in columns, but it should read $x = 300$ (left-hand column) and $x = 0$ (right-hand column).
  - Exercise 2. Third line, add a space between $e \in [0, 1]$ and "can" at the end of the line. Similarly, in the fourth line, add a space so it reads "or bad, x_B) and the probability...". A similar comment applies in the eight line, add a space between $v(\cdot)$ and "is increasing".
- Page 787. Exercise 4. At the end of the page, add a space between $r \in (0, 1)$ and "so its total..."
- Page 788. Exercise 5. Line immediately before part (a) should read "and there is no discounting."
- Page 789.
  - Exercise 6. At the end of the first paragraph, add a space between $c(e)$ and "is the cost..."
  - Exercise 7. Seventh line, add a space between "a level of output" and "q"
- Page 790.
  - Exercise 7. In the paragraph starting with "Using the first-order approach...", add a space between "in this context is" and "$-\sigma^2/2$." In the last line of this paragraph, add also a space before the word "since".
  - Exercise 8. In the fourth line, add a space between "signal" and "s".
- Page 791. Exercise 9.
  - Sentence before the second displayed equation. Add a space between "$Q(\cdot)$" and "satisfies".
  - At the end of this page, add a space between "$c_i(\cdot)$" and "strictly increasing..."

- Page 792. Exercise 9. First sentence. Add a space between "$w_i(\cdot)$" and "to be differentiable"
- Page 793.
  - Exercise 11. Line 7 should read "the buyer responds by accepting or rejecting..." In addition, in last sentence of part (c), add a space between q_H and (q_L) to indicate that q_L is not a function of q_H.
  - Exercise 12. Third line should delete "each of them equally likely"
- Page 794.
  - Exericse 12. Ninth line should read "such probability that alters his willingness...". In addition, part (a) should read "Find equilibrium prices in this context."
  - Exercise 13. The sentence immediately below the displayed equation should read "where e denotes the effort that the agent..."
- Page 795.
  - Exercise 13. First displayed equation (top of the page) should read $u^i(e, w) = w - \theta_i e^2$.
  - Exercise 14. Last sentence of the first paragraph, add a space between "(x_2)" and "depends on..."
- Page 796. Exercise 17.
  - Second line, delete "and screening of customers".
  - Third line, add a space between $i = \{H, L\}$ and "has utility function"
  - Paragraph immediately below the second displayed equation should read "...denotes his preference for quality (where $\alpha_H > \alpha_L > 1$), x represents the quality..."
  - Last sentence before part (a) should read "lower profit for the monopolist."
- Page 797.
  - Exercise 18. Second line after the displayed equation should read "choose whether to buy the product of not, but if they buy..." In addition, the line immediately before part (a) should read "...cost of production is $c(q_i) = q_i^2/2$ where..."
  - Exercise 19. The second line should read "utility function $u(q, \theta) = \theta v(q) - t$, where..."
- Page 798.
  - Exercise 21. Part (b) should read "... and the number of workers hired, n."
  - Exercise 22. Third line should read "employs agent A to do research and..."
- Page 799. Exercise 22. Table 10.2, last row should have a probability of 1 in the left-hand cell, and a probability of 0 in the right-hand cell.

9. **Mathematical appendix.**

- Page 804.
  - Paragraph starting with "For instance, if..." at the top of the page. Last sentence should read "$A \backslash B = A$, since sets A and B do not share any elements."
  - Bullet points 1 and 2 at the middle of the page should have a complement sign $\backslash$, so they read "Union: $A \backslash (B \cup C) = (A \backslash B) \cap (A \backslash C)$." and "Intersection: $A \backslash (B \cap C) = (A \backslash B) \cup (A \backslash C)$."
- Page 806. Section A.3.
  - Second line of the section should read "...and $|-x| = x$ if $x < 0$.
  - The sentence immediately before the first displayed equation should read "...becomes $(x - y) + (y - z) = x - z$. Thus, the triangle inequality..."
- Page 811. Third line should read "between 1/3 and 1/2 for $\{n/(1 + 2n)\}$, and either..."
- Page 825. The displayed equation in the grey-shaded box should read "$F(x') \cap V \neq \varnothing$ for every $x' \in U$."
- Page 827. End of the first paragraph should read "...which exhibits a kink at $ax = by$, that is, at $y = (a/b)x$."

- Page 831. The displayed equation in the grey-shaded box should end with "where $\alpha \in [0,1]$."
- Page 832, at the end of Section A.8. Please add the following: "To test for quasiconcavity and quasiconvexity, we can construct the bordered Hessian matrix of function $f(x)$, a twice differentiable function defined on $\mathbb{R}^N$, which includes first-order (f_i) and second-order (f_{ij}) partial derivatives, where $i, j \in \{1, \ldots, n\}$, as follows.

$$BH = \begin{bmatrix} 0 & f_1 & f_2 & \cdots & f_n \\ f_1 & f_{11} & f_{12} & \cdots & f_{1n} \\ f_2 & f_{21} & f_{22} & \cdots & f_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ f_n & f_{n1} & f_{n2} & \cdots & f_{nn} \end{bmatrix}$$

In this context, if we delete the last $n-k$ rows and columns from matrix BH, and find its associated determinant, we obtain the k^{th}-order leading principal minor of BH, denoted as B_k. We can now use B_k to define how to test quasiconcavity and quasiconvexity.

Test for quasiconcavity. *A twice differentiable function $f(x)$ defined on $\mathbb{R}^N$ is quasiconcave (quasiconvex) if and only if B_k satisfies $(-1)^{k+1}B_k \leq 0$ ($B_k \leq 0$, respectively).*

In other words, if the leading principal minors, beginning with $B_1 \leq 0$, alternate in sign as we consider higher values of k, such as B_2, B_3, and so on, then the function $f(x)$ is quasiconcave.[3] That is,

$$B_1 \leq 0,\ B_2 \geq 0,\ B_3 \leq 0,\ B_4 \geq 0, \ldots$$

However, if the leading principal minors do not alternative in sign, $B_k \leq 0$ for all k, the function is quasiconvex.

As an illustration, consider the utility function $u(x_1, x_2) = x_1 \log(1 + x_2)$, and let us show that it is quasiconcave. First, we find the first- and second-order derivatives,

$$\begin{aligned} u_1 &= \log(1 + x_2) \\ u_2 &= \frac{x_1}{1 + x_2} \\ u_{11} &= 0 \\ u_{12} = u_{21} &= \frac{1}{1 + x_2} \\ u_{22} &= -\frac{x_1}{(1 + x_2)^2}. \end{aligned}$$

Second, we construct the bordered Hessian matrix, as follows.

$$BH = \begin{bmatrix} 0 & u_1 & u_2 \\ u_1 & u_{11} & u_{12} \\ u_2 & u_{21} & u_{22} \end{bmatrix} = \begin{bmatrix} 0 & \log(1 + x_2) & \frac{x_1}{1+x_2} \\ \log(1 + x_2) & 0 & \frac{1}{1+x_2} \\ \frac{x_1}{1+x_2} & \frac{1}{1+x_2} & -\frac{x_1}{(1+x_2)^2} \end{bmatrix}.$$

In this setting, the first leading principal minor is

$$\begin{aligned} B_1 &= 0 \times u_{11} - u_1^2 \\ &= -\log^2(1 + x_2) \end{aligned}$$

which is negative, thus satisfying the condition $(-1)^{1+1} B_1 \leq 0$. Next, we find the second leading principal minor

$$\begin{aligned} B_2 &= u_1 u_2 u_{12} + u_1 u_2 u_{21} - u_2^2 u_{11} - u_1^2 u_{22} \\ &= 2 \log(1 + x_2) \frac{x_1}{(1 + x_2)^2} - \left(\frac{x_1}{1 + x_2} \right)^2 \times 0 + \log^2(1 + x_2) \frac{x_1}{(1 + x_2)^2} \\ &= \frac{x_1 \log(1 + x_2)}{(1 + x_2)^2} [2 + \log(1 + x_2)] \end{aligned}$$

[3] To see this point, note that, when $k = 1$, condition $(-1)^{k+1}B_k \leq 0$ becomes $(-1)^2 B_1 = B_1 \leq 0$. When $k = 2$, condition $(-1)^{k+1}B_k \leq 0$ becomes $(-1)^3 B_2 = -B_2 \leq 0$, which entails $B_2 \geq 0$. A similar argument applies for subsequent values of k, where odd-numbered k's imply $B_k \leq 0$, whereas even-numbered k's entail $B_k \geq 0$.

which is positive, thus satisfying the condition $(-1)^{1+2} B_2 \leq 0$. Since $B_1 \leq 0 \leq B_2$, the above utility function is quasiconcave.

For another example, consider the utility function $u(x_1, x_2) = \sqrt{x_1^2 + x_2^2}$. As above, we first find the first- and second-order derivatives,

$$\begin{aligned}
u_1 &= \frac{x_1}{\sqrt{x_1^2 + x_2^2}} \\
u_2 &= \frac{x_2}{\sqrt{x_1^2 + x_2^2}} \\
u_{11} &= \frac{x_2^2}{\left(x_1^2 + x_2^2\right)^{\frac{3}{2}}} \\
u_{12} = u_{21} &= -\frac{x_1 x_2}{\left(x_1^2 + x_2^2\right)^{\frac{3}{2}}} \\
u_{22} &= \frac{x_1^2}{\left(x_1^2 + x_2^2\right)^{\frac{3}{2}}}.
\end{aligned}$$

Second, we construct the bordered Hessian matrix, as follows.

$$BH = \begin{bmatrix} 0 & u_1 & u_2 \\ u_1 & u_{11} & u_{12} \\ u_2 & u_{21} & u_{22} \end{bmatrix} = \begin{bmatrix} 0 & \frac{x_1}{\sqrt{x_1^2+x_2^2}} & \frac{x_2}{\sqrt{x_1^2+x_2^2}} \\ \frac{x_1}{\sqrt{x_1^2+x_2^2}} & \frac{x_2^2}{\left(x_1^2+x_2^2\right)^{\frac{3}{2}}} & -\frac{x_1 x_2}{\left(x_1^2+x_2^2\right)^{\frac{3}{2}}} \\ \frac{x_2}{\sqrt{x_1^2+x_2^2}} & -\frac{x_1 x_2}{\left(x_1^2+x_2^2\right)^{\frac{3}{2}}} & \frac{x_1^2}{\left(x_1^2+x_2^2\right)^{\frac{3}{2}}} \end{bmatrix}.$$

In this context, the first leading principal minor is

$$\begin{aligned}
B_1 &= 0 \times u_{11} - u_1^2 \\
&= -\frac{x_1^2}{x_1^2 + x_2^2}
\end{aligned}$$

which is negative, thus satisfying condition $B_1 \leq 0$. Next, we find the second leading principal minor

$$\begin{aligned}
B_2 &= u_1 u_2 u_{12} + u_1 u_2 u_{21} - u_2^2 u_{11} - u_1^2 u_{22} \\
&= \frac{-2x_1^2 x_2^2}{\left(x_1^2 + x_2^2\right)^{\frac{5}{2}}} - \frac{x_2^4}{\left(x_1^2 + x_2^2\right)^{\frac{5}{2}}} - \frac{x_1^4}{\left(x_1^2 + x_2^2\right)^{\frac{5}{2}}} \\
&= -\frac{x_1^4 + 2x_1^2 x_2^2 + x_2^4}{\left(x_1^2 + x_2^2\right)^{\frac{5}{2}}} \\
&= -\frac{\left(x_1^2 + x_2^2\right)^2}{\left(x_1^2 + x_2^2\right)^{\frac{5}{2}}} \\
&= -\left(x_1^2 + x_2^2\right)^{-\frac{1}{2}}
\end{aligned}$$

which is negative, thus satisfying the condition $B_2 \leq 0$. Since both leading principal minors are negative, $B_1, B_2 \leq 0$, the above utility function is quasiconvex."

- Page 844. The last sentence of the page (grey-shaded box) should read "That is, $f(x_{\min}) \leq f(x)$ and $f(x_{\max}) \geq f(x)$ for all $x \in X$."
- Page 848. The first displayed equation should have ; rather than : in its last term, so it ends with $[b_k - g_k(x; \theta)]$.
- Page 850. Delete $f(x; \theta) \geq c$ from the penultimate line.
- Page 855.

– The first displayed equation should read as follows:

$$\begin{aligned}\frac{\partial x^*(p,w)}{\partial p} &= -\frac{h_p(x^*(p),p)}{h_x(x^*(p),p)} \\ &= -\frac{-\lambda}{-0.5\times 0.5x^{-1.5}} = -\frac{\lambda x^{1.5}}{0.25},\end{aligned}$$

where $h(x^*(p),p) = 0.5x^{-0.5} - p\lambda$ is the first-order condition we found in the constrained maximization problem. Since the consumer's budget constraint holds with equality, its Lagrange multiplier satisfies $\lambda > 0$, which entails that $\frac{\partial x^*(p,w)}{\partial p} = -\frac{\lambda x^{1.5}}{0.25} < 0$, confirming the above result. ■