Answers to Chapter 13 Exercises

Review and practice exercises

■ 13.1. McDonald’s. Empirical evidence suggests that franchiser-owned McDonald’s restaurants charge lower prices than independent ones. How can this difference be explained?

Answer: This is an example of double marginalization. If firms are vertically integrated (as is the case with franchise-owned McDonald’s restaurants), then the retailer price is the monopoly price for the vertical structure. If the firms are not vertically integrated, then retailer’s profit maximization leads to a second monopoly margin which takes as marginal cost the wholesale price. If the wholesale price is equal to the marginal cost of the upstream firm, then the two retail prices are the same. However, in such a case the upstream firm makes zero profits. We would thus expect the wholesale price to be greater than marginal cost. It follows that the retail price for independent retailers is higher than for franchise-owned retailers.

■ 13.2. Resale price maintenance. The following industries are known to practice or have practiced resale price maintenance: fashion clothing, consumer electronics, fine fragrances. In each case, indicate the probable motivation for RPM and the likely welfare consequences.

Answer: In the case of consumer electronics, there is an important positive externality from investing in sales effort: Retailers can free-ride on the investment efforts made by competing retailers, since one consumer can benefit from the point-of-sale services provided by a retailer (who invested in sales effort) and shop at a lower-price retailer (who did not invest). The result of this externality is that no retailer invests and the demand for the good is lower. An RPM policy induces investment in sales effort (which increases demand); instead of competing in price (which is now the minimum price required by the manufacturer), the retailers compete in investments in sales effort to attract customers. The final beneficiaries of this policy are, obviously, the retailers and the manufacturer. Nevertheless, consumers also benefit from better services at the point of sale.

In the fashion clothing and fine fragrance industries the degree of externality is likely to be much lower. Still, the incentives to invest may not high enough, since the retailer’s
benefit from investing in effort sales depends on the margin it receives. Specifically, if the
margin is low, then the retailer will invest a small amount. Using an RPM policy, the
manufacturer can create a larger margin for the retailer, thus inducing the optimal level of
investment.

13.3. Vermont Castings. Vermont Castings is a manufacturer of wood-burning stoves,
a somewhat complex product. One of Vermont Castings’s dealers once complained about
the terms of the relations between the manufacturer and dealers, stating that “the worst
disappointment is spending a great deal of time with a customer only to lose him to Apple-
wood [a competing retailer] because of price.” Specifically, the dealer lamented “the loss of
3 sales of V.C. stoves ... to people whom we educated and spent long hours with.”

How do you think this problem can be resolved? How would you defend your solution
in an antitrust/competition policy court?

Answer: Obviously, this is a case when one retailer makes an investment in sales effor
while the other free-rides and gets the customer by charging a lower price. As we saw in
Section 13.2, one possible solution to this problem is to use an RPM policy. In this way,
the price would be “fixed” at the minimum level, while the retailers would compete in sales
efforts to attract customers.

One would expect that the minimum price set in the RPM policy would be high, hence,
an antitrust court would not agree with this policy. However, Vermont Casting may argue
that, absent the RPM policy, the retailers will have no incentives to further invest in sales
effort and to provide services to customers, making them (the customers) worse o.
The price may be lower but the services may be poor. On the contrary, by using an RPM
policy, the price may indeed increase, but the customer will now benefit from proper services
provided at the point of sale. Obviously there is a trade-off between using and not using an
RPM policy, with the crucial issue being the level at which the minimum price should be
set.

13.4. Exclusive territories in the European Union. Should the European Union outlaw
the practice of exclusive territories in car dealerships? Why or why not?

Answer: Exclusive territories represent an instance of vertical restraints that helps in re-
solving the inter-retailer externality represented by underinvestment in sales effort. Thus,
if awarded an exclusive territory, a car dealer has all the incentives to invest in advertising,
educating customers, etc., while absent this policy it would, most likely, under-provide these
services. The issue is to quantify the positive and negative effects of such a policy, that is,
to observe how prices and service levels are set in areas where this policy is in use compared
to areas where it is not.

13.5. Exclusive dealing in beer sales. Beer producers are wont to impose an exclusive
dealing clause on retailers. Discuss the efficiency and market power effects of this practice.

Answer: Exclusive dealing has the effect of foreclosing upstream competition, that is, com-
petition between manufacturers. This is likely to increase market power and reduce welfare.
One possible defense of exclusive dealing is that there may be important investments to be
made by the manufacturer at the retail store, so that, if there is competition between manufacturers, an externality may arise and lead to sub-optimal investments. In the case of car dealerships, such externality might arise in the context of dealer training to be done by the manufacturer. In the case of beer, however, it is unlikely there are significant manufacturer externalities.

**Challenging exercises**

13.6. **Wintel.** Consider the following highly simplified picture of the personal computer industry. A large number of price-taking firms assemble computer systems; call them “computer OEMs” (Original Equipment Manufacturers). Each of these firms must buy three inputs for each computer system that it sells: (1) a variety of components that are themselves supplied competitively and collectively cost the computer OEM $500 per computer; (2) the Windows operating system, available only from Microsoft, at a price \( p_M \), to be discussed below; and (3) a Pentium microprocessor, available only from Intel, at a price \( p_I \), also to be discussed below. Since each computer system requires precisely one operating system and one microprocessor, the marginal cost of a computer to an OEM is \( 500 + p_M + p_I \). Assume that competition among OEMs drives the price of a computer system down to marginal cost, so we have \( p = 500 + p_M + p_I \), where \( p \) is the price of a computer system. The demand for computer systems is given by \( Q = 100,000,000 - 50,000 p \). Microsoft is the sole supplier of the Windows operating system for personal computers. The marginal cost to Microsoft of providing Windows for one more computer is zero. Intel is the sole supplier of the Pentium microprocessors for personal computers. The marginal cost to Intel of a Pentium microprocessor for one more computer system is $300.

(a) Suppose that Microsoft and Intel simultaneously and independently set the prices for Windows and Pentium chips, \( p_M \) and \( p_I \). What are the Nash equilibrium prices, \( \hat{p}_M \) and \( \hat{p}_I \)?

**Answer:** First consider Microsoft’s best response to any given price \( p_I \) by Intel. Using the underlying demand for computers, the demand for Windows is given by \( Q = 100,000,000 - 50,000(500 + p_M + p_I) \). For a given value of \( p_I \), the demand for Windows is \( Q = 75,000,000 - 50,000p_I - 50,000p_M \). The corresponding marginal revenue for Microsoft is \( MR_M = 1500 - p_I - Q/25,000 \). Setting this equal to Microsoft’s marginal cost of zero gives \( q_M^* = 37,500,000 - 25,000p_I \), and the corresponding optimal price of \( p_M^* = 750 - p_I / 2 \). Next, repeat these steps to consider Intel’s best response to any given price \( p_M \) by Microsoft. The only difference is that Intel has a marginal cost of $300. These calculations imply that \( MR_I = 1500 - p_M - Q/25,000 \). Setting this equal to Intel’s marginal cost of $300 gives with the corresponding optimal price of \( p_I^* = 900 - p_M / 2 \). Finally, solve these two equations together to get the Nash Equilibrium prices, which are \( p_M^* = 400 \) and \( p_I^* = 700 \). Note that the resulting price of a computer is $1600, so total computer sales are 20 million.

Now suppose that Microsoft and Intel sit down to negotiate an agreement to sell Windows
and Pentium chips as a package to computer OEMs for a package price of $p_{MI}$.

(b) What package price would maximize Microsoft’s and Intel’s combined profits? By how much would an agreement between Microsoft and Intel boost their combined profits?

**Answer:** This is a basic monopoly pricing problem for Microsoft and Intel collectively. If they set a package price of $p_{MI}$, the price of a computer system will be $500 + p_{MI}$. The number of computers sold will be $Q = 100,000,000 - 50,000(500 + p_{MI})$. The marginal revenue corresponding to this demand curve is $MR_{MI} = 1500 - Q/25,000$. Setting this equal to the (combined) marginal cost of $300$ gives a quantity of $Q^*_MI = 30,000,000$ and a corresponding package price of $p^*_MI = $900. At this price, the contribution to Microsoft’s and Intel’s combined profits is $600 per computer times 30 million machines, or $18 billion. In comparison, the Nash Equilibrium in part (a) involved a contribution of $800 per computer times 20 million machines, or $16 billion. Cutting a deal is worth $2 billion to Microsoft and Intel together.

(c) Would final consumers benefit from such an agreement between Microsoft and Intel, or would they be harmed? What about computer OEMs? Relate your answer to your calculations in parts (a) and (b), and explain the economic principles underlying your answer.

**Answer:** Since Windows and Pentium are complements, Microsoft’s profits are decreasing in the price of Pentium chips, and Intel’s prices are decreasing in the price set by Microsoft. This implies that the two companies together would benefit from lower prices than they would set separately. Indeed, comparing parts (a) and (b) we see a lower price in part (b) than in part (a). Final consumers thus benefit from the cooperation between Microsoft and Intel. OEMs are indifferent, because their profits are driven to zero by competition, whatever the prices of components. (In practice, OEMs would benefit in the short run from the lower input prices, and OEMs able to differentiate themselves with their own brand names would benefit for a longer period of time.) The underlying principle is that cooperation among suppliers of complements tends to benefit consumers, just as cooperation among suppliers of substitutes (i.e., collusion) harms consumers. This is closely related to the theory of “double marginalization” that we discussed in this chapter; the only difference is that Microsoft and Intel stand in a “complements” relationship rather than a buyer/seller relationship.

13.7. Two-part tariffs. Suppose that a manufacturer sells to $n$ retailers by means of a two-part tariff $(f, w)$: a fix fee $f$ and a wholesale price $w$. Explain the intuition of the result that the greater the degree of retailer competition, the greater the optimal wholesale price.

**Answer:** Suppose there are two downstream firms, $R_1$ and $R_2$; and that $M$’s marginal cost is $c$, whereas each $R_i$ has no other variable cost than the wholesale price $w$ (and no capacity constraints, that is, retailers can buy as much as they want from the manufacturer). Without retailer competition setting $w = c$ leads the retailer to set $p = p^M$. With retailer competition, $w = c$ would lead to a retail price below monopoly level. This is because, at $p = p^M$, each retailer would have an incentive to lower price and steal market share from
the rival retailer.

Specifically, suppose that retailers compete à la Bertrand. Then in equilibrium retail price will be equal to the wholesale price (recall that the wholesale price is the retailer’s marginal cost). If \( w = c \), then \( p = c \) and both manufacturer and retailers make zero profits. Under Bertrand competition, the optimal solution would be to set \( w = p^M \) instead. For this wholesale price, retailers set, in equilibrium, \( p = p^M \), and the manufacturer gets monopoly profits (in this case, the franchise fee would be zero).

It can be shown that, when retailers compete à la Cournot (an intermediate level of competition), then the manufacturer’s optimal solution is to set a wholesale price (strictly) between \( w \) and \( p^M \) (see Exercise 13.9). Together, these results suggest that the greater the degree of competition between retailers, the higher the optimal wholesale price.

\section*{13.8. Bargaining.} Consider the following extension of the framework presented in Section 13.1. Firm \( M \) determines the wholesale price. Then firms \( M \) and \( R \) bargain over the distribution of the remaining surplus, the result being that each gets one half of the “pie.” Show that the equilibrium is efficient, that is, total profits are maximized in equilibrium. What is the minimal assumption about the outcome from bargaining that is necessary for the result to hold?

\section*{13.9. Downstream Cournot competition.} Consider an industry with one upstream firm and \( n \) downstream firms that compete à la Cournot. Show that the optimal wholesale price is strictly between marginal cost and monopoly price.

\textbf{Answer:} As in the text, suppose that the upstream firm offers retailers a contract stipulating a fixed fee, \( f \), as well as a wholesale price, \( w \). From Section 8.2, we know that the equilibrium price under Cournot competition is given by \( p^N = \frac{1}{3}a + \frac{2}{3}w \), where \( w \) is the effective marginal cost paid by retailers. Output per firm is given by \( q^N = \frac{1}{2} (a - p^N) = \frac{1}{3} (a - w) \). Finally, equilibrium profit per firm is \( \pi^R = \frac{1}{2} (a - w)^2 \). This implies that the upstream firm can ask for as much as \( f = \frac{1}{4} (a - w)^2 \) as a fixed fee.

The upstream firm’s total profit is therefore given by

\[
\pi^M = 2 \left( (w - c) q^N + \pi^R \right) = 2 \left( w \frac{a - w}{3} + \left( \frac{a - w}{3} \right)^2 \right)
\]

Maximizing with respect to \( w \), we get the optimal value \( w = \frac{1}{4} a + \frac{3}{4} c \). Notice that the optimal \( w \) is a convex combination of \( a \) and \( c \), that is, the coefficients of \( a \) and \( c \) add up to 1. Moreover, from Section 3.2 we know that monopoly profit is given by \( p^M = \frac{1}{2} a + \frac{1}{2} c \). Since the relative weight of \( w \) on \( c \) is greater than the weight of \( p^M \) on \( c \) (and \( c < a \)), it follows that \( w \) is less than monopoly price. By the same argument, it is also clear that \( w \) is greater than marginal cost.