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*14 Entry

*14.1 Innovation and Patent Races

Market Power as a Precursor of Innovation

Table 14.1 Imitation with Bertrand Pricing

		Brydox	
		Innovate	*Imitate*
Apex:	*Innovate*	-1,-1	$-1, 0$
	Imitate	$0, -1$	**0,0**

Payoffs to: (Apex, Brydox).

Table 14.2 Imitation with Profits in the Product Market

		Brydox	
		Innovate	*Imitate*
Apex:	*Innovate*	1,1	**1,2**
	Imitate	**2,1**	0,0

Payoffs to: (Apex, Brydox).

"Patent Race for a New Market"

Players
Three identical firms, Apex, Brydox, and Central.

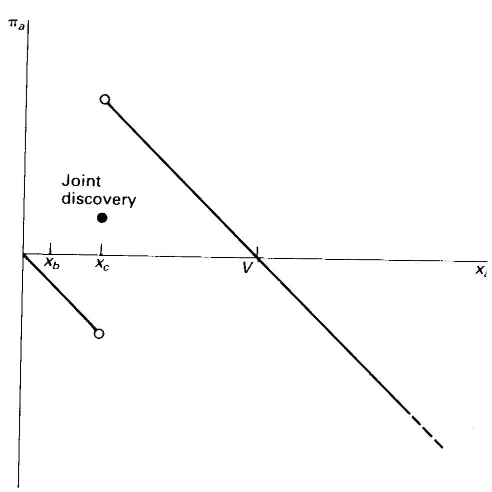
The Order of Play
Each firm simultaneously chooses research spending $x_i \geq 0$, $(i = a, b, c)$.

Payoffs
Firms are risk neutral and the discount rate is zero. Innovation occurs at time $T(x_i)$ where $T' < 0$. The value of the patent is V, and if several players innovate simultaneously they share its value.

$$\pi_i = \begin{cases} V - x_i & \text{if } T(x_i) < T(x_j), \ (\forall j \neq i) \quad \text{(Firm } i \text{ gets the patent)} \\ \frac{V}{1+m} - x_i & \text{if } T(x_i) = T(x_k), \quad \text{(Firm } i \text{ shares the patent w} \\ & \quad m = 1 \text{ or } 2 \text{ other firms)} \\ -x_i & \text{if } T(x_i) > T(x_j) \text{ for some } j \quad \text{(Firm } i \text{ does not get the pat} \end{cases}$$

Figure 14.1 The Payoffs in "Patent Race for a New Market"

Figure 13.4 The Payoffs in "Patent Race for a New Market."



MIXED STRATEGY EQUILIBRIUM

There does exist a symmetric mixed strategy equilibrium. The probability with which firm i chooses a research level less than or equal to x will be $M_i(x)$. Since we know that the pure strategies $x_a = 0$ and $x_a = V$ yield zero payoffs, if Apex mixes over the support $[0, V]$ then the expected payoff for every strategy mixed between must also equal zero. The expected payoff from the pure strategy x_a is the expected value of winning minus the cost of research,

$$V \cdot Pr(x_a \geq X_b, x_a \geq X_c) - x_a = 0, \tag{1}$$

which can be rewritten as

$$V \cdot Pr(X_b \leq x_a) Pr(X_c \leq x_a) - x_a = 0, \tag{2}$$

or

$$V \cdot M_b(x_a) M_c(x_a) - x_a = 0. \tag{3}$$

We can rearrange equation (14.**??**) to obtain

$$M_b(x_a) M_c(x_a) = \frac{x_a}{V}. \tag{4}$$

If all three firms choose the same mixing distribution M, then

$$M(x) = \left(\frac{x}{V}\right)^{1/2} \text{ for } 0 \leq x \leq V. \tag{5}$$

"Patent Race for an Old Market"

Players
An incumbent and an entrant.

The Order of Play
(1) The firms simultaneously choose research spending x_i and x_e, which result in research achievements $f(x_i)$ and $f(x_e)$, where $f' > 0$ and $f'' < 0$.
(2) Nature chooses which player wins the patent using a function g that maps the difference in research achievements to a probability between zero and one.

$$Prob(\text{incumbent wins patent}) = g[f(x_i) - f(x_e)], \qquad (6)$$

where $g' > 0,\ g(0) = 0.5$, and $0 \leq g \leq 1$.
(3) The winner of the patent decides whether to spend Z to implement it.

Payoffs
The old patent yields revenue y and the new patent yields v. The payoffs are shown in Table 14.3.

Table 14.3 The Payoffs in "Patent Race for an Old Market"

Outcome	$\pi_{incumbent}$	$\pi_{entrant}$
The entrant wins and implements	$-x_i$	$v - x_e - Z$
The incumbent wins and implements	$v - x_i - Z$	$-x_e$
Neither player implements	$y - x_i$	$-x_e$

Equation (14.**??**) specifies the function $g[f(x_i) - f(x_e)]$ to capture the three ideas of (a) diminishing returns to inputs, (b) rivalry, and (c) winning a patent race as a probability.

THE EQUILIBRIUM IN THE PATENT GAME

The entrant will do no research unless he plans to implement, so we will disregard the strongly dominated strategy, ($x_e > 0$, *no implementation*). The incumbent wins with probability g and the entrant with probability $1-g$, so from Table 14.3 the expected payoff functions are

$$\pi_{incumbent} = (1-g[f(x_i)-f(x_e)])(-x_i)+g[f(x_i)-f(x_e)]Max\{v-x_i-Z, y-x_i\} \quad (7)$$

and

$$\pi_{entrant} = (1-g[f(x_i)-f(x_e)])(v-x_e-Z)+g[f(x_i)-f(x_e)](-x_e). \quad (8)$$

On differentiating and letting f_i and f_e denote $f(x_i)$ and $f(x_e)$ we obtain the first order conditions

$$\frac{d\pi_i}{dx_i} = -(1-g[f_i-f_e])-g'f_i'(-x_i)+g'f_i'Max\{v-x_i-Z, y-x_i\}-g[f_i-f_e] = 0 \quad (9)$$

and

$$\frac{d\pi_e}{dx_e} = -(1-g[f_i-f_e])+g'f_e'(v-x_e-Z)-g[f_i-f_e]+g'f_e'x_e = 0. \quad (10)$$

Equating (14.**??**) and (14.**??**), which both equal zero, we obtain

$$-(1-g)+g'f_i'x_i+g'f_i'Max\{v-x_i-Z, y-x_i\}-g = -(1-g)+g'f_e'(v-x_e-Z)-g+g'f_e' \quad (11)$$

which simplifies to

$$f_i'[x_i + Max\{v-x_i-Z, y-x_i\}] = f_e'[v-x_e-Z+x_e], \quad (12)$$

or

$$\frac{f_i'}{f_e'} = \frac{v-Z}{Max\{v-Z, y\}}. \quad (13)$$

$$\frac{f_i'}{f_e'} = \frac{v - Z}{Max\{v - Z, y\}}. \tag{14}$$

Outcome 1. *The entrant and incumbent spend equal amounts, and each implements if successful.*
This happens if there is a big gain from patent implementation, that is, if

$$v - Z \geq y, \tag{15}$$

so that equation (14.**??**) becomes

$$\frac{f_i'}{f_e'} = \frac{v - Z}{v - Z} = 1, \tag{16}$$

which implies that $x_i = x_e$.

Outcome 2. *The incumbent spends more and does not implement if he is successful (he acquires a sleeping patent).*
This happens if the gain from implementation is small, that is, if

$$v - Z < y, \tag{17}$$

so that equation (14.**??**) becomes

$$\frac{f_i'}{f_e'} = \frac{v - Z}{y} < 1, \tag{18}$$

which implies that $f_i' < f_e'$. Since we assumed that $f'' < 0$, f' is decreasing in x, and it follows that $x_i > x_e$.

*14.2 Takeovers and Greenmail: The Free Rider Problem

"The Free Rider Problem in Takeovers"
(Grossman & Hart [1980])

Players
A bidder and a continuum of shareholders, with amount m of shares.

The Order of Play
(1) The bidder offers p per share for the m shares.
(2) Each shareholder decides whether to accept the bid (denote by θ the fraction that accept).
(3) If $\theta \geq 0.5$, the bid price is paid out, and the value of the firm rises from v to $(v+x)$ per share.

Payoffs
If $\theta < 0.5$, the takeover fails, the bidder's payoff is zero, and the shareholder's payoff is v per share. Otherwise,

$$\pi_{bidder} = \left\{ \theta m(v+x-p) \quad \text{if } \theta \geq 0.5. \right.$$

$$\pi_{shareholder} = \begin{cases} p & \text{if the shareholder accepts.} \\ v+x & \text{if the shareholder rejects.} \end{cases}$$

In any iterated dominant strategy equilibrium, the bidder's payoff equals zero. Bids above $(v+x)$ are dominated strategies, since the bidder could not possibly profit from them. But if the bid is any lower, an individual shareholder should hold out for the new value of $(v + x)$ rather than accepting p. To be sure, when they all do that, the offer fails and they end up with v, but no individual wants to accept if he thinks the offer will succeed. The only equilibria are the many strategy profiles that lead to a failed takeover, or a bid of $p = (v + x)$ accepted by a majority, which succeeds but yields a payoff of zero to the bidder. If organizing an offer has even the slightest cost, the bidder would not do it.

Greenmail

Managers often use what we might call the "Noble Managers" model to justify greenmail. In this model, current management knows the true value of the firm, which is greater than both the current stock price and the takeover bid. They pay greenmail to protect the shareholders from selling their mistakenly undervalued shares.

The Corrupt Managers model faces the objection that it fails to explain why the corporate charter does not prohibit greenmail. The Noble Managers model faces the objection that it implies either that shareholders are irrational or that stock prices rise after greenmail because shareholders know that the greenmail signal (giving up the benefits of a takeover) is more costly for a firm which really is not worth more than the takeover bid.

"Greenmail to Attract White Knights"

(Shleifer & Vishny [1986])

Players

The manager, the market, and bidder Brydox. (Bidders Raider and Apex do not make decisions.)

The Order of Play

Figure 14.2 shows the game tree. After each time t, the market picks a share price p_t.

(0) Unobserved by any player, Nature picks the state to be (A), (B), (C), or (D), with probabilities 0.1, 0.3, 0.1, and 0.5, unobserved by any player.

(1) Unless the state is (D), the Raider appears and offers a price of 15. The manager's information partition becomes $\{$(A), (B,C), (D)$\}$; everyone else's becomes $\{$(A,B,C), (D)$\}$.

(2) The manager decides whether to pay greenmail and extinguish the Raider's offer at a cost of 5 per share.

(3) If the state is (A), Apex appears and offers a price of 25 if greenmail was paid, and 30 otherwise.

(4) If the state is (B), Brydox decides whether to buy information at a cost of 8 per share. If he does, then he can make an offer of 20 if the Raider has been paid greenmail, or 27 if he must compete with the Raider.

(5) Shareholders accept the best offer outstanding, which is the final value of a share. If no offer is outstanding, the final value is 5 if greenmail was paid, 10 otherwise.

Payoffs

The manager maximizes the final value.

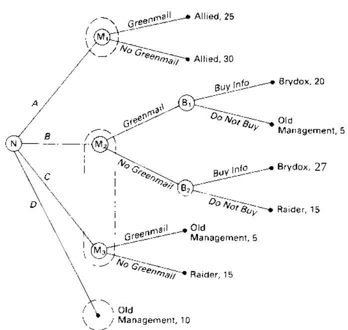
The market minimizes the absolute difference between p_t and the final value.

If he buys information, Brydox receives 23 $(= 31 - 8)$ minus the value of his offer; otherwise he receives zero.

Figure 14.2 The Game Tree for "Greenmail To Attract White Knights"

Figure 15.3 The Game Tree for ''Greenmail To Attract White Knights''

Figure 15.3 The Game Tree for ''Greenmail To Attract White Knights''



The payoffs specify that the manager should maximize the final value of the firm, rather than a weighted average of the prices p_0 through p_5. This assumption is reasonable because the only shareholders to benefit from a high value of p_t are those that sell their stock at t. The manager cannot say: "The stock is overvalued: Sell!", because the market would learn the overvaluation too, and refuse to buy.

The prices 15, 20, 27, and 30 are assumed to be the results of blackboxed bargaining games between the manager and the bidders. Assuming that the value of the firm to Brydox is 31 ensures that he will not buy information if he foresees that he would have to compete with the Raider. Since Brydox has a dominant strategy— buy information if the Raider has been paid greenmail and not otherwise— our focus will be on the market price and the decision of whether to pay greenmail. This model is also not designed to answer the question of why the Raider appears. His behavior is exogenous. As the model stands, his expected profit is positive since he is sometimes paid greenmail, but if he actually had to buy the firm he would regret it in states B and C, since the final value of the firm would be 10.

We will see that in equilibrium the manager pays greenmail in states (B) and (C), but not in (A) or (D). Table 14.4 shows the equilibrium path of the market price.

Table 14.4 The Equilibrium Price in "Greenmail to Attract White Knights"

State	Probability	p_0	p_1	p_2	p_3	p_4	p_5	Final Management
(A)	0.1	14.5	19	30	30	30	30	Allied
(B)	0.3	14.5	19	16.25	16.25	20	20	Brydox
(C)	0.1	14.5	19	16.25	16.25	5	5	Old management
(D)	0.5	14.5	10	10	10	10	10	Old management

The market's optimal strategy amounts to estimating the final value. Before the market receives any information, its prior beliefs estimate the final value to be 14.5 (= 0.1[30] + 0.3[20]+ 0.1[5] + 0.5[10]). If state (D) is ruled out by the arrival of the Raider, the price rises to 19 (= 0.2[30] + 0.6[20]+ 0.2[5]). If the Raider does not appear, it becomes common knowledge that the state is (D), and the price falls to 10.

If the state is (A), the manager knows it and refuses to pay greenmail in expectation of Apex's offer of 30. Observing the lack of greenmail, the market deduces that the state is (A), and the price immediately rises to 30.

If the state is (B) or (C) the manager does pay greenmail and the market, ruling out (A), uses Bayes' Rule to assign probabilities of 0.75 to (B) and 0.25 to (C). The price falls from 19 to 16.25 (= 0.75[20] + 0.25[5]).

It is clear that the manager should not pay greenmail in states (A) or (D), when the manager knows that Brydox is not around to investigate. What if the manager deviates in the information set (B,C) and refuses to pay greenmail? The market would initially believe that the state was (A), so the price would rise to $p_2 = 30$. But the price would fall again after Apex failed to make an offer and the market realized that the manager had deviated. Brydox would refuse to enter at Time 3, and the Raider's offer of 15 would be accepted. The payoff of 15 would be less than the expected payoff of 16.25 from paying greenmail.

The model does not say that greenmail is always good for the shareholders, only that it can be good *ex ante*. If the true state turns out to be (C), then greenmail was a mistake, *ex post*, but since state (B) is more likely, the manager is correct to pay greenmail in information set (B,C). What is noteworthy is that greenmail is optimal even though it drives down the stock price from 19 to 16.25. Greenmail communicates the bad news that Apex is not around, but makes the best of that misfortune by attracting Brydox.

"Predatory Pricing"
(Kreps & Wilson [1982a])

Players
The entrant and the monopolist.

The Order of Play
(0) Nature chooses the monopolist to be *Strong* with low probability θ and *Weak*, with high probability $(1-\theta)$. Only the monopolist observes Nature's move.
(1) The entrant chooses *Enter* or *Stay Out* for the first town.
(2) The monopolist chooses *Collude* or *Fight* if he is weak, *Fight* if he is strong.
(3) Steps (1) and (2) are repeated for towns 2 through N.

Payoffs
The discount rate is zero. Table 14.5 gives the payoffs per period, which are the same as in Table 4.1.

Table 14.5 Predatory Pricing

		Weak Incumbent	
		Collude	*Fight*
Entrant:	*Enter*	**40,50**	$-10, 0$
	Stay out	$0, 100$	**0,100**

Payoffs to: (Entrant, Incumbent).

In describing the equilibrium, we will denote towns by names such as i_{-30} and i_{-5}, where the numbers are to be taken purely ordinally. The entrant has an opportunity to enter town i_{-30} before i_{-5}, but there are not necessarily 25 towns between them. The actual gap depends on θ but not N.

Part of the equilibrium for Predatory Pricing

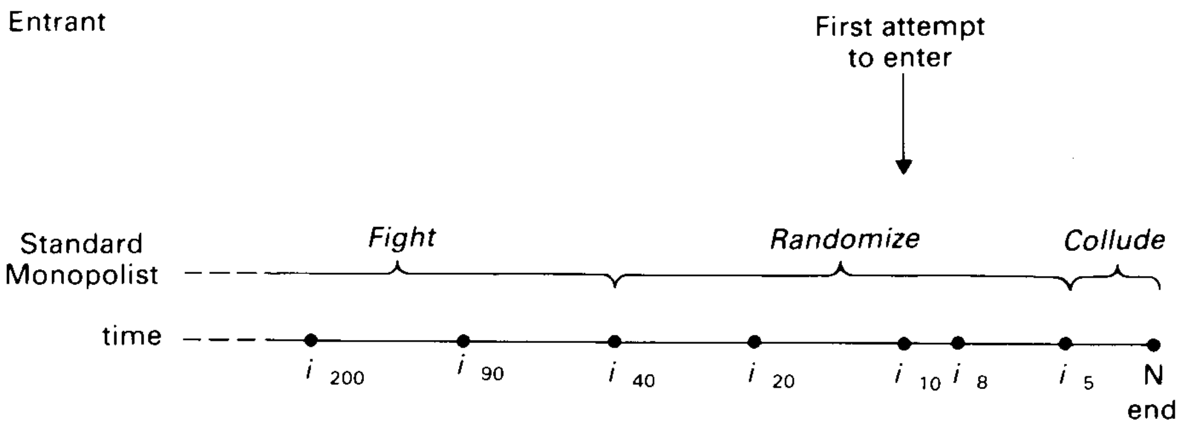
Entrant: Enter first at town i_{-10}. If entry has occurred before i_{-10} and been answered with *Collude*, enter every town after the first one entered.

Strong monopolist: Always fight entry.

Weak monopolist: Fight any entry up to i_{-30}. Fight the first entry after i_{-30} with a probability $m(i)$ that diminishes until it reaches zero at i_{-5}. If *Collude* is ever chosen instead, always collude thereafter. If *Fight* was chosen in response to the first attempt at entry, increase the mixing probability $m(i)$ in subsequent towns.

Figure 14.3 The Equilibrium in Predatory Pricing

Figure 13.1 Predatory Pricing: strategies over time

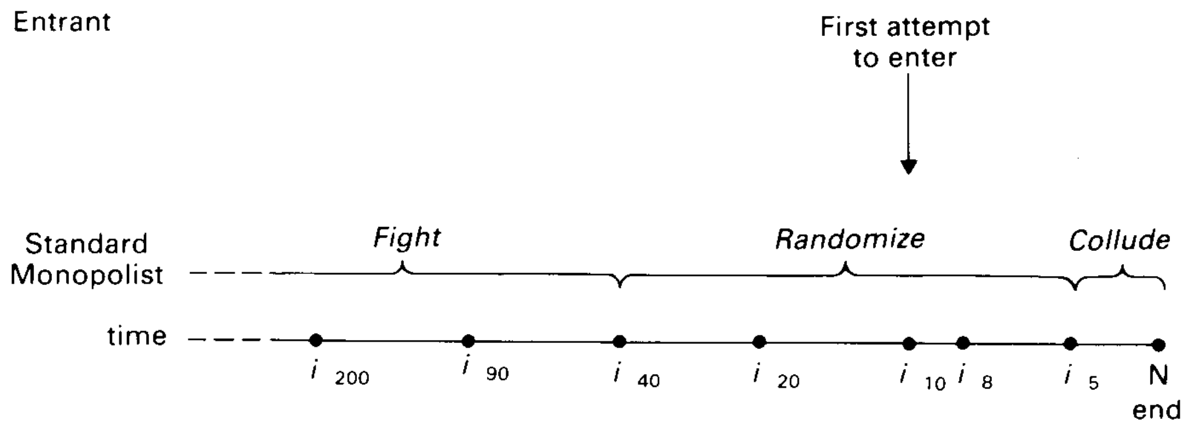


The entrant will certainly stay out until i_{-30}. If no town is entered until i_{-5} and the monopolist is $Weak$, then entry at i_{-5} is undoubtedly profitable. But entry is attempted at i_{-10}, because since $m(i)$ is diminishing in i, the weak monopolist probably would not fight even there.

Out of equilibrium, if an entrant were to enter at i_{-90}, the weak monopolist would be willing to fight, to maintain i_{-10} as the next town to be entered. If he did not, then the entrant, realizing that he could not possibly be facing a strong monopolist, would enter every subsequent town from i_{-89} to i_{-1}. If no town were entered until i_{-5}, the weak monopolist would be unwilling to fight in that town, because too few towns are left to protect. If a town between i_{-30} and i_{-5} has been entered and fought over, the monopolist raises the mixing probability that he fights in the next town entered, because he has a more valuable reputation to defend.

Figure 14.3 The Equilibrium in Predatory Pricing

Figure 13.1 Predatory Pricing: strategies over time

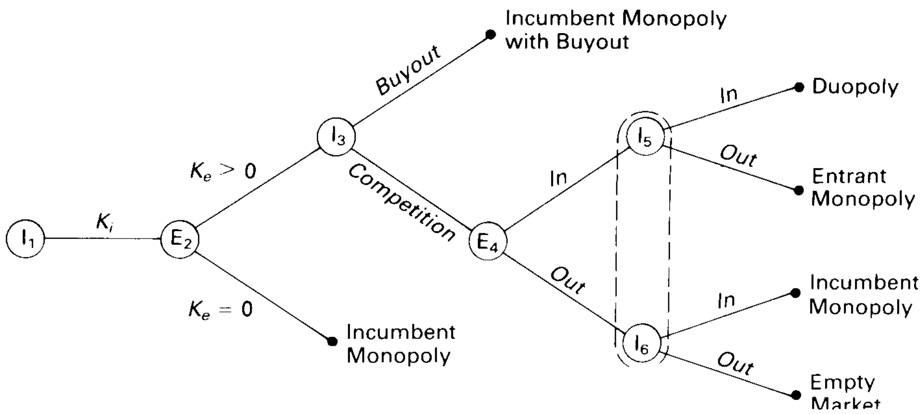


What if the entrant deviated and entered town i_{-20}? The equilibrium calls for a mixed strategy response beginning with i_{-30}, so the weak monopolist must be indifferent between fighting and not fighting. If he fights, he loses current revenue but the entrant's posterior belief that he is strong rises, rising more if the fight occurs late in the game. The entrant knows that in equilibrium the weak monopolist would fight with a probability of, say, 0.9 in town i_{-20}, so fighting there would not much increase the belief that he was strong, but if he fought in town i_{-13}, where the mixing probability has fallen to 0.2, the belief would rise much more. On the other hand, the gain from a given reputation diminishes as fewer towns remain to be protected, so the mixing probability falls over time.

The description of the equilibrium strategies is incomplete because describing what happens after unsuccessful entry becomes rather intricate.

Figure 14.4 "Entry for Buyout"

Figure 13.3 Entry for Buyout



Players

The incumbent and the entrant.

The Order of Play

(1) The incumbent selects capacity K_i.
(2) The entrant decides whether to enter or stay out, choosing a capacity $K_e \geq 0$.
(3) If the entrant picks a positive capacity, the incumbent decides whether to buy him out at price B.
(4) If the entrant has been bought out, the incumbent selects output $q_i \leq K_i + K_e$.
(5) If the entrant has not been bought out, each player decides whether to stay in the market or exit.
(6) If a player has remained in the market, he selects the output $q_i \leq K_i$ or $q_e \leq K_e$.

Payoffs

Each unit of capacity costs a, the constant marginal cost is c, a firm that stays in the market incurs fixed cost F, and there is no discounting. There is only one period of production.
If no entry occurs, $\pi_{inc} = [p(q_i) - c]q_i - aK_i - F$ and $\pi_{ent} = 0$.
If entry occurs and is bought out, $\pi_{inc} = [p(q_i) - c]q_i - aK_i - B - F$ and $\pi_{ent} = B - aK_e$.

$$\pi_{incumbent} = \begin{cases} [p(q_i, q_e) - c]q_i - aK_i - F & \text{if the incumbent stays.} \\ -aK_i & \text{if the incumbent exits.} \end{cases}$$

$$\pi_{entrant} = \begin{cases} [p(q_i, q_e) - c]q_e - aK_e - F & \text{if the entrant stays.} \\ -aK_e & \text{if the entrant exits.} \end{cases}$$

A Numerical Example

Assume that the market demand curve is

$$p = 100 - q_i - q_e. \tag{19}$$

Let the cost per unit of capacity be $a = 10$, the marginal cost of output be $c = 10$, and the fixed cost be $F = 601$. Assume that output follows Cournot behavior and the bargaining solution splits the surplus equally, in accordance with the Nash bargaining solution and Rubinstein (1982).

If the incumbent faced no threat of entry, he would behave as a simple monopolist, choosing a capacity equal to the output which solved

$$\underset{q_i}{Maximize}\ (100 - q_i)q_i - 10q_i - 10q_i. \tag{20}$$

Problem (14.**??**) has the first order condition

$$80 - 2q_i = 0, \tag{21}$$

so the monopoly capacity and output would both equal 40, yielding a net operating revenue of 1,399 ($= [p - c]q_i - F$), well above the capacity cost of 400.

Under these parameters the incumbent chooses the same output and capacity of 40 even if entry is possible but buyout is not. If the potential entrant were to enter, he could do no better than to choose $K_e = 30$, which costs 300. With capacities $K_i = 40$ and $K_e = 30$, Cournot behavior leads the two firms to solve

$$\underset{q_i}{Maximize}\ (100 - q_i - q_e)q_i - 10q_i \ \ s.t.\ \ q_i \leq 40 \tag{22}$$

and

$$\underset{q_e}{Maximize}\ (100 - q_i - q_e)q_e - 10q_e \ \ s.t.\ \ q_e \leq 30, \tag{23}$$

which have first order conditions

$$90 - 2q_i - q_e = 0 \tag{24}$$

and

$$90 - q_i - 2q_e = 0. \tag{25}$$

The Cournot outputs both equal 30, yielding a price of 40 and net revenues of $R_i^d = R_e^d = 299$ $(= [p-c]q_i - F)$. The entrant's profit net of capacity cost would be -1 $(= R_e^d - 30a)$, less than the zero from not entering.

What if both entry and buyout are possible, but the incumbent still chooses $K_i = 40$? If the entrant chooses $K_e = 30$ again, then the net revenues would be $R_e^d = R_i^d = 299$, just as above. If he buys out the entrant, the incumbent, having increased his capacity to 70, produces a monopoly output of 45. Half of the surplus from buyout is

$$\begin{aligned} B &= (1/2)\left[\underset{q_i}{Maximum}\ \{[p(q_i) - c]q_i | q_i \leq 70\} - F - (R_e^d + R_i^d)\right] \\ &= (1/2)[(55 - 10)45 - 601 - (299 + 299)] = 413. \end{aligned} \tag{26}$$

The entrant is bought out for his Cournot revenue of 299 plus the 413 which is his share of the buyout surplus, a total buyout price of 712. Since 712 exceeds the entrant's capacity cost of 300, buyout induces entry which would otherwise have been deterred. Nor can the incumbent deter entry by picking a the same Cournot output of 60 and the same buyout price of 712. Choosing K_i less than 30 allows the entrant to make a profit even without being bought out.

Realizing that entry cannot be deterred, the incumbent would choose a smaller initial capacity. A Cournot player whose capacity is less than 30 would produce right up to capacity. Since buyout will occur, if a firm starts with a capacity less than 30 and adds one unit, the marginal cost of capacity is 10 and the marginal benefit is the increase (for the entrant) or decrease (for the incumbent) in the buyout price. If it is the entrant who adds a unit of capacity, the net revenue R_e^d rises by at least $(40-10)$, the lowest possible Cournot price minus the marginal cost of output. Moreover, R_i^d falls because the entrant's extra output lowers the market price, so under our bargaining solution the buyout price rises by more than 15 $(= \frac{40-10}{2})$ and the entrant should add extra capacity up to $K_e = 30$. A parallel argument shows why the incumbent should build a capacity of at least 30. Increasing the capacities any further leaves the buyout price unchanged, because the duopoly net revenues are unaffected, so both firms choose exactly 30.

The industry capacity equals 60 when buyout is allowed, but after the buyout only 45 is used. Industry profits in the absence of possible entry would have been 999 $(= 1,399-400)$, but with buyout they are 824 $(= 1,424 - 600)$, so buyout has decreased industry profits by 175. Consumer surplus has risen from 800 $(= 0.5[100 - p(q|K = 40)][q|K = 40])$ to 1,012.5 $(= 0.5[100 - p(q|K = 60)][q|K = 60])$, a gain of 212.5, so buyout raises total welfare in this example. The increase in output outweighs the inefficiency of the entrant's investment in capacity, an outcome that depends on the particular parameters chosen.

Uncertainty in Innovation.

"Patent Race for an Old Market," is only one way to model innovation under uncertainty. A more common way is to use continuous time with discrete discoveries and specifies that discoveries arrive as a Poisson process with parameter $\lambda(X)$, where X is research expenditure, $\lambda' > 0$, and $\lambda'' < 0$, as in Loury (1979) and Dasgupta & Stiglitz (1980). Then

$$\begin{aligned} Prob(\text{invention at } t) &= \lambda e^{-\lambda(X)t}; \\ Prob(\text{invention before } t) &= 1 - e^{-\lambda(X)t}. \end{aligned} \tag{27}$$

A little algebra gives us the current value of the firm, R_0, as a function of the innovation rate, the interest rate, the post-innovation value V_1, and the current revenue flow R_0. The return on the firm equals the current cash flow plus the probability of a capital gain.

$$rV_0 = R_0 - X + \lambda(V_1 - V_0), \tag{28}$$

which implies

$$V_0 = \frac{\lambda V_1 + R_0 - X}{\lambda + r}. \tag{29}$$

Expression (14.??) is frequently useful.

fat-cat effect

A common theme in entry models is what has been called the **fat-cat effect** by Fudenberg & Tirole (1986a, p. 23). Consider a two-stage game, in the first stage of which an incumbent firm chooses its advertising level and in the second stage plays a Bertrand subgame with an entrant. If the advertising in the first stage gives the incumbent a base of captive customers who have inelastic demand, he will choose a higher price than the entrant. The incumbent has become a "fat cat." The effect is present in many models. In Section 13.3's Hotelling Pricing Game a firm located so that it has a large "safe" market would choose a higher price. In Section 5.5's Customer Switching Costs a firm that has old customers locked in would choose a higher price than a fresh entrant in the last period of a finitely repeated game.