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THE ENTRY-INDUCING EFFECTS OF HORIZONTAL MERGERS: AN EXPLORATORY ANALYSIS*

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Antitrust law presumes that entry normally prevents or reverses anticompetitive effects from horizontal mergers. But when sunk costs associated with entry are at levels suggested by prevailing market structure, the opportunity for entry created by an anticompetitive merger plausibly is too small to induce entry, even absent Stiglerian 'barriers to entry.' This is illustrated for Cournot and Bertrand models. Significant entry also makes otherwise profitable Bertrand mergers unprofitable, assuming no efficiencies. Consequently, the entry issue can be collapsed into the efficiency issue: If a presumably profitable merger does not generate significant efficiencies, it cannot be expected to induce entry.

I. INTRODUCTION

US COURTS have rejected several merger challenges on the grounds that actual or threatened entry would reverse or prevent any significant anticompetitive effects.[1] One held: 'In the absence of significant barriers [to entry], a company probably cannot maintain supra-competitive pricing for any length of time.'[2] Another held: 'If there are no significant barriers to entry . . . eliminating competitors will not enable the survivors to reap a monopoly profit: any attempt to raise prices above the competitive level will lure into the market new competitors able and willing to offer their commercial goods or personal services for less.'[3]

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[1] While the same cannot be said about other countries, they all have so few decided cases that useful international comparisons are impossible. Fragmentary evidence on EC and UK law (Finbow and Parr [1995, pp. 216–30], Fine [1993, pp. 719–21]) suggests many similarities to US case law.

[2] United States v. Baker Hughes Inc., 908 F.2d 981, 987 (D.C. Cir. 1990). The Supreme Court had previously remarked that 'without barriers to entry into the market it would presumably be impossible to maintain supracompetitive prices for an extended time.' Cargill, Inc. v. Monfort of Colorado, Inc., 479 U.S. 104, 119–20 n.15 (1986).

[3] United States v. Syufy Enterprises, 903 F.2d 659, 664 (9th Cir. 1990).

There are also indications that the courts do not include sunk costs as 'barriers to entry.' Apparently following Stigler,[4] one court held: 'The disadvantage of new entrants as compared to incumbents is the hallmark of an entry barrier. . . . The mere fact that entry requires a large absolute expenditure of funds does not constitute a 'barrier to entry'; a new entrant is disadvantaged only to the extent that he must pay more to attract those funds than would an established firm.'[5] The court added that the 'main sources of entry barriers are: (1) legal license; (2) control over an essential or superior resource; (3) entrenched buyer preferences for established brands or company reputations; and (4) capital market evaluations imposing higher capital costs on new entrants.'[6] Another court held: 'High capital requirements . . . pose no barrier to entry.'[7]

As suggested a decade ago by Schmalensee [1987], many courts appear to presume that entry normally will prevent or cure anticompetitive effects from a merger.[8] One district court explicitly stated that it is 'normally a valid argument' that entry will cause the market to 'correct itself.'[9]

This paper reconsiders the role entry should play in merger cases. Following Salop's [1991] suggestion, the analysis focuses on the effect of the merger itself on entry. By restricting output or raising prices following an anticompetitive merger, incumbents increase the amount an entrant would earn and create an opportunity for entry. Whether this opportunity leads to entry depends on several things, notably the extent of the output restriction or price increase and potential entrants' sunk costs. Our exploratory analysis of these issues reveals no basis for the courts' presumption that entry 'normally' can be counted on to prevent or reverse anticompetitive effects from mergers.

We postulate free entry in the Stiglerian sense and rule out strategic behavior by incumbents to deter entry or render it unprofitable after the fact. Consequently, our analysis does not apply to an industry subject to some form of limit pricing. We show that, in a symmetric Cournot model (noncooperative quantity setting with a homogeneous product), the entry opportunity plausibly is insufficient to attract entry. Cournot models, however, are not well suited to the task at hand, so we concentrate instead on a Bertrand model (noncooperative price setting) with differentiated products. This model has been relied on extensively by antitrust enforcers in recent years. Analytical methods are of little use with this model because products are differentiated and because predictions vary with demand parameters and market shares. In the spirit of many modern macroeconomic studies (see Kydland and Prescott [1996]), we rely on merger simulations in randomly generated industries. We leave to others consideration of entry in models of coordinated interaction.[10]

The simulations indicate that even large Bertrand mergers create entry opportunities plausibly too small to induce entry. Moreover, entry renders otherwise profitable Bertrand mergers unprofitable for the merging firms, assuming no efficiencies. Cournot mergers are normally unprofitable even without entry, and entry makes them much more unprofitable. To the extent these models are relevant, firms proposing to merge must expect to achieve significant efficiencies or not to induce entry. If enforcement agencies and courts are willing to rely on the special expertise of the merging firms, there may be no need to consider entry explicitly because it collapses into the consideration of efficiencies: If a proposed (and, hence, privately profitable) merger does not generate significant efficiencies, it also cannot be expected to induce entry. Thus, we conclude that the proper role for entry in many merger cases may be none whatsoever!

Section II recapitulates some basic economics of entry and the effects of mergers on entry. Section III uses a simple symmetric Cournot model to explain why the entry opportunity created by a merger is plausibly quite small. Sections IV and V describe the Bertrand simulations, present their results, and discuss their implications. Section VI offers a few concluding comments.

[4] The leading antitrust treatise (Areeda, Hovenkamp, and Solow [1995, p. 61]) warns that the definition of 'barriers to entry' used by many economists (e.g., Stigler) 'does not respond to the primary reason why antitrust law concerns itself with them.' Thus, it (pp. 53–54) concludes that, for purposes of antitrust law: 'A barrier to entry is any factor that permits firms already in the market to earn returns above the competitive level while deterring outsiders from entering.'

[5] Los Angeles Land Co. v. Brunswick Corp., 6 F.3d 1422, 1428 (9th Cir. 1993). This court may have backed away from its Stiglerian position when it later held that 'barriers to entry' include any 'factors in the market that deter entry while permitting incumbent firms to earn monopoly returns.' American Professional Testing Service, Inc. v. Harcourt Brace Jovanovich Legal and Professional Publications, Inc., 108 F.3d 1147, 1154 (9th Cir. 1997).

[6] Los Angeles Land Co., 6 F.3d at 1427 n.4; see also Rebel Oil Co., Inc., v. Atlantic Richfield Co., 51 F.3d 1421, 1439 (9th Cir. 1995); American Professional Testing Service, 108 F.3d at 1154. The third factor might implicate sunk costs.

[7] Advo, Inc. v. Philadelphia Newspapers, Inc., 51 F.3d 1191, 1200 (3d Cir. 1995). The statement would not be troublesome if the capital costs were not sunk, but some or all of the entry costs in this case certainly were sunk.

[8] The merger case law's treatment of entry appears to have been influenced by the contestability literature of the 1980s (Baumol [1982]; Baumol, Panzer, and Willig [1982, 1983]). This is ironic because the most useful contribution of the contestability literature may have been to highlight the importance of sunk costs. The courts' interest in entry conditions, however, predates contestability. See, e.g., United States v. Phillipsburg National Bank, 399 U.S. 350, 377 (1970).

[9] Community Publishers, Inc. v. Donrey Corp., 892 F. Supp. 1146, 1168 (W.D. Ark. 1995). See also Baker [1997].

[10] In the models of Davidson and Deneckere [1984] and Werden and Baumann [1983], mergers can make collusion *less* likely by increasing profits in a punishment or non-collusion regime.

II. MERGERS, SUNK COSTS, AND ENTRY

The classic work on entry is that of Joe Bain.[11] Following the model of perfect competition, Bain [1956, pp. 6–7, 10–11, 17] approached entry from a long-run perspective,[12] arguing (p. 3) that the 'conditions of entry' should be 'evaluated roughly by the advantages of established sellers in an industry over potential entrants, these advantages being reflected in the extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry.' Bain identified three 'barriers to entry.' 'Absolute cost advantages' could prevent entry by allowing incumbents to sell profitably at prices below the costs of potential entrants.[13] 'Product differentiation' could prevent entry by allowing incumbents to charge higher prices than entrants and thus also to sell profitably when potential entrants could not. And 'economies of scale' could prevent entry by offering the choice between entry at a suboptimal scale with a concomitant cost disadvantage, or entry at efficient scale with a concomitant depressing effect on prices.[14]

George Stigler [1968, p. 67] also approached entry from a long-run perspective, defining: 'A barrier to entry . . . as a cost of producing . . . which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry.' He [1968, p. 70] argued that 'product differentiation is . . . a barrier to entry . . . only if the costs of differentiation (design, advertising, etc.) are higher for a new firm than an existing firm. Otherwise differentiation is a (possible) source of economies of scale.' He [1968, p. 67] also objected to calling economies of scale a 'barrier to entry.'[15]

[11] Of course, Bain neither invented the concept of entry nor first stressed its importance. Both Bain and Stigler formulated their views on entry substantially prior to the publication of their main works on the subject (Bain [1956], Stigler [1968]). Indeed, both expressed their views in the same session of the 1949 meetings of the American Economic Association (Bain [1950], Stigler [1950]).

[12] Such an approach has no direct application to merger policy. The long run can be a very long time indeed, so what occurs in the long run is likely to be of little consequence in evaluating the discounted present value of competitive effects from a merger.

[13] Demsetz [1982] explained that cost advantages arising from scarce factors of production (e.g., unique natural resources, patents, or taxi medallions) generate rents to the scarce factors, which should not be confused with output prices exceeding competitive levels. Thus, a strong case can be made for defining 'barriers to entry' so as not to embrace scarce factors. Doing so, however, means that 'barriers to entry' are not necessary for mergers to have anticompetitive effects.

[14] Bain's approach was, for the most part, formalized by Dixit [1979] in the context of a duopoly model in which economies of scale arise from fixed costs.

[15] While not including them in his list of "barriers to entry," Bain also discussed capital requirements as a possible source of cost disadvantages for entrants. Stigler [1968, p. 70] argued that "capital requirements (which are a source, perhaps, of economies of scale)" "are not a barrier to entry" since "existing firms also have to meet these requirements."

Many economists (e.g., Baumol and Willig [1981, p. 408]; von Weizsäcker [1979, p. 400]) have followed Stigler more than Bain, defining a 'barrier to entry' in terms of differential costs for potential entrants and incumbents.

Baumol and Willig [1981] clarified the entry issue by focusing on sunk costs— irreversible investments in the industry. Sunk costs create a fundamental asymmetry between incumbents and potential entrants; they serve as a 'barrier to entry' in a sense similar to that of Stigler, and they serve as a 'barrier to exit' (see Gilbert [1989, pp. 487–93]) by committing incumbents to future price or output strategies (see Dixit [1981]). While sunk costs may play a complex role in a strategic setting, their role is exceedingly simple in the absence of both strategic behavior and uncertainty; entry will occur if, and only if, the present value of future profits from successful entry exceeds sunk costs associated with entry (cf. Kessides [1990]).

Mergers, at least normally, cannot affect the magnitude of sunk costs, but they do directly affect the prospects for recouping them. Willig [1991, pp. 308–10] explains how this works in the Cournot setting, using reaction functions in quantity space (see also Horizontal Merger Guidelines promulgated by the U.S. Department of Justice and Federal Trade Commission [1992, § 3.0]). Merging firms restrict output, and although nonmerging incumbents expand output somewhat, there is still a net reduction in output (see Farrell and Shapiro [1990]). This makes entry more attractive by leaving more room in the market for the entrant. Both market price and the entrants' market share are greater when entry follows a merger than when it does not, all other things being equal. Consequently, the merger makes entry more profitable and may turn unprofitable entry into profitable entry.

A similar analysis applies to a Bertrand model with differentiated products. Merging firms increase their prices, and nonmerging incumbents increase their prices in response (see Deneckere and Davidson [1985]). The price increases by incumbents make entry more attractive by increasing the prices of substitutes for the entrant's product. Both the entrant's price and market share are greater when entry follows a merger than when it does not, all other things being equal. Consequently, the merger makes entry more profitable and may turn unprofitable entry into profitable entry.

III. BASIC ANALYTICS OF COURNOT MERGERS AND ENTRY

A merger eliminates an incumbent, and if it was covering its sunk costs, then one may argue, so too should an equally efficient entrant. This logic holds in a symmetric Cournot model with constant marginal costs and no capacity constraints. The effect of a merger is simply to make one incumbent vanish, and if the industry is in long-run equilibrium before the merger, equilibrium is restored by the entry of a new firm to replace the one that vanished due to

merger. But a model is which a merger merely makes an incumbent vanish is of doubtful relevance to merger policy (see Perry and Porter [1985, pp. 219–20]).[16]

A Cournot model used for example by Farrell and Shapiro [1990, pp. 118–19] and Werden [1991] features linear demand and quadratic variable costs dependent on capital stock. This cost assumption implies that mergers have the effect of reallocating scarce productive capacity. Let x_i and k_i be the quantity produced by firm i and its capital stock. Let X and p be total industry quantity and industry price. Demand and variable costs are then

$$p(X) = a - X$$
$$C_i(x_i) = x_i^2/2k_i.$$

Defining

$$\kappa_i = k_i/(1 + k_i)$$
$$\kappa = \sum \kappa_i,$$

it is straightforward to show (see Werden [1991]) that in equilibrium

$$x_i = p\kappa_i$$
$$p = a/(1 + \kappa).$$

To see that a merger in a Cournot industry *may not* provide a sufficient entry opportunity, it suffices to consider a symmetric industry in which all of the $k_i = k$. With n incumbents, $\kappa = nk/(1 + k)$, and each has quasi-rents

$$\pi_n = a^2k(1 + 2k)/2[1 + (n + 1)k]^2. \quad (1)$$

Several additional assumptions permit a crucial inference about the sunk cost associated with entry. First, technology is assumed to be lumpy, so any entrant will enter at an integer multiple of the scale of the incumbents. Second, sunk costs are assumed to be proportional to scale, so the question of whether entry will occur at all can be answered by asking whether entry is profitable at the same scale as incumbents. Finally, the premerger industry is assumed to have been in free-entry, long-run equilibrium, with all fixed costs having been sunk.[17] Under these assumptions, the sunk cost associated with entry must fall within the interval (π_{n+1}, π_n). If sunk cost were less than π_{n+1}, at least one additional firm would already have entered the industry, and if sunk cost were greater than π_n, at least one incumbent would not have entered the industry.

Now consider a merger of any two incumbents followed by the entry of a firm identical to a premerger incumbent. The new equilibrium can be calculated by noting that

$$\kappa = (n - 1)k/(1 + k) + 2k/(1 + 2k).$$

It is useful to rewrite this as

$$\kappa = nk/(1 + k) + k/(1 + k)(1 + 2k), \quad (2)$$

which immediately proves (as is otherwise rather obvious) that a merger followed by entry reduces price. It can also be shown that the quasi-rents of the merging firms are reduced.

Inspection of equation 2 also reveals the limiting cases of the model. As k approaches infinity, marginal cost becomes constant; a merger just makes an incumbent vanish, and entry exactly undoes the effect of the merger. As k approaches zero, marginal cost becomes infinitely steep; mergers cease to have any price effects and hence cannot induce entry. These limiting cases are much less interesting than intermediate cases, and to identify a relevant intermediate range of k, we calculate $k_m = (2 + 2n)^{-½}$, the value that maximizes the proportionate price reduction from merger followed by entry.

Since the sunk cost associated with entry falls within the interval (π_{n+1}, π_n), the proportionate increase in quasi-rents necessary to induce entry falls within the interval $(0, \pi_n/\pi_{n+1} - 1)$. An arbitrarily small increase in quasi-rents would induce entry if entrant quasi-rents in the premerger equilibrium were just slightly too small to induce entry. An increase in entrant quasi-rents of $\pi_n/\pi_{n+1} - 1$ would be necessary to induce entry if sunk cost were π_n and incumbents barely covered sunk cost in the premerger equilibrium. An antitrust enforcer or court is an uninformed outside observer who would reasonably treat sunk cost as a random variable with a uniform distribution over the interval $(0, \pi_n/\pi_{n+1} - 1)$.

The entrant's quasi-rents after merger are

$$\pi_e = a^2k(1 + 2k)^3/2[1 + (n + 4)k + 2(n + 1)k^2]^2. \quad (3)$$

The proportionate increase in entrant quasi-rents caused by the merger is $\pi_e/\pi_{n+1} - 1$. An outside observer does not know whether this is sufficient to induce entry, but rather attaches the probability $(\pi_e - \pi_{n+1})/(\pi_n - \pi_{n+1})$ to entry following a merger. It is easily seen that this expression does not depend on a, and while not so easy to see, it depends little on n.

For a four-firm industry and five values of k, Table I indicates the price effects of a merger with and without entry, the probability of entry to an outside observer, and the components of that probability. To illustrate what happens in the limit, the table considers a value of k so low that the merger has a trivial anticompetitive effect and one so high that the anticompetitive effect is almost exactly offset by entry. The table also considers three intermediate values of k: $.2k_m$, k_m, and $5k_m$, where $k_m \approx .316$. For these values, the quasi-rent increase necessary to assure entry is 10–39%, while the entrant

[16] Real-world mergers may result in shutting down productive facilities, but that probably occurs because the industry is not in long-run equilibrium, and such mergers are likely to entail the acquisition of valuable intangible assets.

[17] Dropping these two assumptions, and the assumption that there is a single period, has no affect on the entry probability calculations below, provided that recurring fixed costs are independent of the number of competitors and that one-period equilibrium is repeated each period.

quasi-rent increase caused by merger is 1–28%. Consequently, the entry probabilities within this wide intermediate range of k's are at most .71 and as little as .11. When a merger does not simply make an incumbent vanish, it creates less, perhaps far less, of an entry opportunity.

TABLE I
ILLUSTRATIVE RESULTS FOR FOUR-FIRM INDUSTRIES AND VARIOUS CAPITAL STOCKS

	k				
	.01	$.2k_m$	k_m	$5k_m$	25
Percentage price *increase* from merger but not entry	0.0	0.5	5.0	15.6	24.1
Percentage price *decrease* from merger and entry	0.9	4.1	7.0	4.1	0.4
Percentage increase in quasi-rents necessary to *assure* entry	1.9	9.8	26	38.7	43.6
Percentage increase in entrant quasi-rents caused by merger	0.0	1.0	9.0	27.5	42.5
Probability of entry to an outside observer	.02	.11	.35	.71	.97

This section demonstrates that significant Cournot mergers plausibly do not induce entry, but the analysis of Cournot mergers is not an entirely satisfactory basis for antitrust policy. A stylized fact of U.S. industry is that marginal costs typically are constant, but if constant marginal cost is assumed, Cournot mergers unrealistically serve only to make an incumbent vanish. Cournot mergers have more plausible effects if marginal costs are increasing and dependent on capital stock, but steeply increasing marginal costs do not appear to be realistic. Finally, there is the well-known problem that, absent efficiencies, Cournot mergers are rarely privately profitable for the merging firms (see Salant, Switzer, and Reynolds [1983]). Thus, we turn our attention to a model without these limitations.

IV. AN INTRODUCTION TO ENTRY WITH BERTRAND MERGERS

Mergers in a Bertrand model with differentiated products bring competing brands under common ownership, which affects their pricing (and other strategies over the long run). Mergers are privately profitable for the merging firms (see Deneckere and Davidson [1985]), until entry is considered, and the predictions of the model are not highly dependent on the cost assumption.

We explore the entry-inducing effects of Bertrand mergers using a model previously used to simulate the effects of hypothetical (see Froeb and Werden [1996], Werden and Froeb [1994]) and actual (see Werden [1997, p. 106]) differentiated products mergers. It is a discrete choice model that assumes logit demand, constant marginal cost, and that each firm sells a single product premerger. The choice probability of product i with price p_i is denoted P_i and has the form

$$\frac{\exp(\alpha_i-\beta p_i)}{\sum_j \exp(\alpha_j-\beta p_j)}$$

where the α_i reflect generally perceived utility differences among products and β is a parameter controlling substitutability among products. As β approaches infinity, products cease to be differentiated, and performance becomes competitive with any size distribution of firms. As β approaches zero, products become so highly differentiated that each becomes a monopoly with no competitive interaction with the others. Thus, intermediate values of β are those of interest.

The primitives of this model are the α_i, β, and the individual firm marginal costs. These are not readily observable quantities with real-world mergers, and as we have previously done, we transform the model so the primitives are observable. Product n is denominated the outside good, and it is assumed that $p_n \equiv 0$ to make the utility of the outside good a constant. The average premerger price for the inside goods is denoted $\bar{p}$. The aggregate elasticity of demand for the inside goods can now be defined as

$$\varepsilon \equiv \left[\frac{\partial \log \sum_{i=1}^{n-1} P_i(\lambda p_i)}{\partial \lambda} \bar{p} \right]_{\lambda=1} = -\beta \bar{p} P_n .$$

The choice probabilities for the inside goods conditional on the choice being an inside good, are termed the "shares." The transformation makes the primitives of the model the individual firm shares and prices, β, and ϵ. Since the welfare effects of logit mergers are independent of premerger relative prices (see Werden and Froeb [1994, p. 415]), all premerger prices are arbitrarily set to 1. In the analysis below, we use β values in the range of those estimated from actual choice data.[18]

We begin with symmetric, four-firm industries. The first two rows of Table II indicate the profitability of the mergers for the merging firms, with and without entry. Without entry, there is a modest increase in the merging firms' quasi-rents, π_m, which would motivate merger; however, when merger is followed by entry, there is a substantial decrease in quasi-rents, which would deter a merger unless it generated efficiencies yielding increases in quasi-rents of up to 20%. Table II also reports the sort of calculations reported in Table I. Interestingly, entry mitigates the price increases from the mergers, but it does not reverse them as with the Cournot mergers, because the entrants' product is differentiated from those of the merging firms. (As

[18] What actually matters is the value of β times the average price, so we use values of β in the range of the estimated β times average price from other studies. The α_i are determined by the other demand parameters and especially the shares (see Werden, Froeb, and Tardiff [1996, p. 96]).

a result of adding a new product, welfare may increase even though prices increase.) The upper bound of the quasi-rent increase necessary to induce entry following these Bertrand mergers is 13–27%, while the entrant quasi-rent increase caused by merger is substantially less, and as low as 3%. Consequently, the entry probabilities are in the range .21–.33.

TABLE II
RESULTS FOR SYMMETRIC FOUR-FIRM BERTRAND INDUSTRIES WITH LOGIT DEMAND AND VARIOUS DEMAND PARAMETERS

	$-\epsilon, \beta$			
	1, 8	1, 4	2, 8	2, 4
Percentage *increase* in π_m from merger but not entry	5.2	3.1	3.1	1.0
Percentage *decrease* in π_m from merger and entry	18.8	16.2	16.2	11
Percentage price increase from merger but not entry	2.0	3.0	1.5	1.8
Percentage price increase from merger and entry	0.4	0.9	0.5	0.8
Percentage increase in quasi-rents necessary to *assure*	27.1	21.8	21.8	13.3
Percentage increase in entrant quasi-rents caused by	9	6.5	6.5	2.9
Probability of entry to an outside observer	.33	.30	.30	.21

V. BERTRAND MERGER SIMULATIONS FOR RANDOMLY GENERATED INDUSTRIES

The preceding section suggests that the entry opportunity created by Bertrand mergers plausibly is insufficient to attract entry, and entry makes otherwise profitable mergers unprofitable. Because the symmetric case is too restrictive to justify general conclusions, we explore these issues further and consider welfare effects in randomly generated asymmetric industries. The number of incumbents is selected from a uniform distribution of the integers 4–8. Shares are produced by taking draws from a uniform distribution of real numbers and normalizing the sum to 1. The first two firms are assumed to merge, and the single potential entrant is assumed to have the demand and cost parameters of a randomly selected incumbent. β is a real number drawn from a uniform distribution over (2, 10). The premerger, equilibrium elasticity of demand is drawn from a uniform distribution with support on $(1-\beta, -.5)$. The assumptions on the distributions of the demand parameters generally yield values in the range of those estimated from actual choice data.

The analysis is based on 2500 simulations, 470 of which involve mergers that increase industry average price by over 2%, assuming no entry.[19] Table III displays four descriptive statistics on the randomly generated industries—the two demand parameters and two concentration indices employed by the Merger Guidelines. The Change in the HHI (ΔHHI) is twice the product of the merging firms' (percentage) shares. The Post-Merger HHI (HHI) is the Change in the HHI plus the premerger HHI, i.e., the sum of the squares of the premerger market shares.

The logit model maintains Independence of Irrelevant Alternatives, and in that sense, all products are equally good substitutes for each other. We vary this assumption by alternatively assuming nested logit demand, with just the two merging firms and the potential entrant in a nest. The nest parameter[20] is arbitrarily set at .7. Table IV displays descriptive statistics on the 1000 simulations, 390 of which involve mergers that increase industry average price by over 2%, assuming no entry. In Tables III and IV, mergers increasing average price over 2% are substantially larger than average, and they occur in industries with relatively inelastic demands and relatively poor substitute products, as indicated by lower β's.

TABLE III
DESCRIPTIVE STATISTICS FOR 2500 SIMULATED NON-NESTED LOGIT BERTRAND MERGERS

Statistic	All Mergers				Mergers Increasing Ave. Price Over 2%	
	Min.	Max.	Mean	Median	Mean	Median
ΔHHI	0	4992	930	630	2116	1934
HHI	1721	9999	3794	3387	5587	5330
ϵ	–8.5	–0.5	–2.8	–2.3	–1.5	–1.2
β	2.0	10.0	6.0	6.1	4.8	4.3

There is an important and intentional contrast between the nested and non-nested logit Bertrand simulations. In the non-nested logit merger simulations, all products are equally good substitutes for each other; the merging firms are neither particularly close nor particularly distant competitors; and entry is neither targeted directly to the merging firms nor especially away from them. In the nested logit simulations, entry is precisely targeted at the merging firms, which themselves are particularly close competitors. These two factors maximize the entry-inducing effect of a merger and the procompetitive effect of entry following a merger.

[19] For our limited purposes, the number of simulations is more than adequate; however, to generate the true distribution for any of the quantities mentioned below, a far greater number would be preferable. It comes as no surprise that less than 20% of the simulations resulted in price increases exceeding 2%. We have noted elsewhere (Werden and Froeb [1994, pp. 422–24] [1996, pp. 73–78]) that the price increases from Bertrand mergers tend to be quite modest unless ΔHHI is vastly greater than the 50 or 100 levels that define safe harbors in the Merger Guidelines. And Werden [1996] shows that modest marginal cost reductions can cause mergers of modest size to result in price decreases.

[20] Werden [1997, pp. 102–103] provides an intuitive explanation of the economic significance of various nest parameter values.

TABLE IV
DESCRIPTIVE STATISTICS FOR 1000
SIMULATED NESTED LOGIT BERTRAND MERGERS

Statistic	All Mergers				Mergers Increasing Ave. Price Over 2%	
	Min.	Max.	Mean	Median	Mean	Median
ΔHHI	0	4653	927	639	1685	1446
HHI	1683	9732	3796	3353	4863	4954
ϵ	–8.8	–0.5	–2.8	–2.3	–1.9	–1.5
β	2.0	10.0	6.0	6.0	5.0	4.3

There are two primary lessons from these simulations. First, entry renders otherwise profitable Bertrand mergers unprofitable for the merging firms. If entry necessarily follows a merger, only 5.2% of the nested logit mergers are profitable, and only 2.7% of the non-nested logit Bertrand mergers are profitable. Moreover, these few mergers remain profitable when followed by entry only because we unrealistically allow only one entrant and it gets a particularly bad parameter draw. To the merging firms, the *expected* profitability of their merger is *always* negative if it would be followed by entry.

The magnitude of the entry effect on profitability is also notable. For the non-nested Bertrand mergers, the median quasi-rent increase without entry is .5%, while the median quasi-rent decrease with entry is 12.1%. For the nested Bertrand mergers, the median quasi-rent increase without entry is 3.7%, while the median quasi-rent decrease with entry is 18.1%. Thus, the profit effect of entry is not just a little larger than the profit effect of entry; it is dramatically larger—15 times as large in the non-nested case. Consequently, rational incumbents would merge only if they believed that their merger would not induce entry, or if they believed that their merger would generate dramatic efficiencies that would offset the adverse profit effects of entry.

The second primary lesson is that merging firms may plausibly believe that entry would not follow their merger. This is not easily demonstrated because we cannot draw inferences about sunk costs as before. The assumption that the industries are in long-run equilibrium is problematic for the randomly generated industries. They commonly contain at least one small, high-cost firm. Such a firm would exist in free-entry equilibrium only if the entry process made cost and scale stochastic (as we have), and a stochastic entry process makes inferences difficult. In the real world, many very small firms probably earn insufficient quasi-rents to cover sunk costs.

To reflect the entry-inducing potential of the simulated mergers, we calculate the percentage increase in entrant quasi-rents caused by the merger. It is calculated by first simulating the entry without the merger, then simulating the entry with the merger. The important question is how large a quasi-rent increase is necessary to induce entry. Table II sheds a little light on this question by indicating that, for reasonable parameter values, at most a 13–27% increase in entrant quasi-rents would be necessary to induce entry into symmetric, four-firm industries in long-run equilibrium. If the results portrayed in Table II were indicative of sunk costs for all the simulated industries, entrant quasi-rent increases of 25% would almost always be sufficient to induce entry, quasi-rent increases of 10% would be sufficient a bit less than half the time, quasi-rent increases of 5% would be sufficient a bit less than a quarter of the time.

Table V presents the mean, median, and cumulative distribution of the quasi-rent increases from the simulations.[21] Because the entrant shares a nest with only the merged firm, the nested logit simulations present the greatest entry opportunity and the greatest quasi-rent increases. No strong conclusions can be drawn from Table V, but guidance from Table II suggests that most of the mergers would not induce entry. For the non-nested mergers not resulting in price increases over 2%, the entry opportunity is probably insufficient for the vast majority of the mergers. Even for the nested mergers resulting in price increases over 2%, the entry opportunity is still plausibly insufficient for a non-trivial proportion of the mergers.

Also of interest from the simulations are welfare effects, which Tables VI–IX indicate in a variety of ways. Tables VI and VII report the probabilities of various favorable outcomes, such as entry or an increase in welfare for the entire industry, assuming that the entrant quasi-rent increase necessary to attract entry is alternatively 2%, 5%, 10%, or 25%. The probabilities are unconditional with respect to the occurrence of entry. The welfare calculations reflect the effect of the entry if, and only if, the increase in entrant quasi-rents exceeds the assumed threshold.

Entry is more likely with the nested logit model, because it involves the best entry opportunity. For any entry hurdle, entry is far more likely for mergers increasing price by over 2% than for the total population of mergers because these larger mergers create a better entry opportunity than smaller ones. This may be seen as reassuring, since it means that the more anticompetitive mergers tend to attract entry. But, ironically, the implication is that larger mergers are more likely than smaller ones to yield a net increase in consumer or total welfare! Prices necessarily rise if entry is not induced by merger, but they may fall with entry, and the larger mergers are much more likely to induce entry.

[21] Had we considered multiple, identical potential entrants, Table V would apply to just the first in line. If the first in line elected to enter, the quasi-rent increases for the second in line would be less that those shown in Table V and, indeed, could be negative. Particularly large mergers, however, might lead to multiple entries, and a second entrant may follow a particularly unlucky first entrant.

TABLE V
PERCENTAGE INCREASE IN ENTRANT QUASI-RENTS
FROM SIMULATED BERTRAND MERGERS

Category of Mergers	Demand Assumption	Mean	Median	Cumulative Distribution (Pct.) < 2	< 5	< 10	< 25
All Mergers	Non-Nested	3.2	1.4	59.8	82.4	92.8	98.9
	Nested	8.5	5.9	18.8	43.3	73.0	94.9
Mergers Increasing Average Price by Over 2%	Non-Nested	10.3	7.6	0.9	27.7	63.0	94.3
	Nested	15.0	11.3	1.0	10.5	41.0	87.4

TABLE VI
UNCONDITIONAL PROBABILITIES OF VARIOUS FAVORABLE OUTCOMES
FROM SIMULATED NON-NESTED LOGIT BERTRAND MERGERS

Entry Hurdle Quasi-Rent Percentage	All Mergers				Mergers Increasing Average Price by Over 2%			
	Entry Occurs	Consumer Welfare Increases	Total Welfare Increases	Average Price Decreases	Entry Occurs	Consumer Welfare Increases	Total Welfare Increases	Average Price Decreases
2	.402	.351	.272	.062	.991	.836	.583	.166
5	.176	.140	.077	.018	.723	.577	.294	.079
10	.072	.050	.014	.005	.370	.266	.030	.028
25	.011	.005	.009	.000	.057	.028	.000	.000

If the entry hurdle is as low as 2%, entry is nearly universal following the larger mergers, and they enhance consumer welfare the great bulk of the time. Entry is by no means rare following the smaller mergers, but they are not especially likely to enhance consumer welfare, except for the nested logit mergers. If the entry hurdle is between 2% and 10%, entry is still fairly common for the larger mergers. In this range, entry following mergers is unlikely to enhance total welfare. Also, average price often increases even though consumer welfare increases. The consumer welfare increase in such cases stems from the increase in product variety.[22] If the entry hurdle is as high as 25%, entry is very uncommon. When entry does occur, it generally does not enhance consumer welfare. With a high entry threshold, entry tends to follow only the largest mergers, and entry of a firm comparable to a randomly selected incumbent is insufficient to reverse the mergers' adverse effects on consumer welfare. But entry is still more likely with larger mergers, so there is still a tendency for the largest mergers to have the most favorable consumer welfare effects.

[22] Consumer welfare in discrete choice models is calculated as a compensating variation. See Small and Rosen [1981]. An additional choice increases a consumer's expected maximum utility.

TABLE VII
UNCONDITIONAL PROBABILITIES OF VARIOUS FAVORABLE OUTCOMES
FROM SIMULATED NESTED LOGIT BERTRAND MERGERS

Entry Hurdle Quasi-Rent Percentage	All Mergers				Mergers Increasing Average Price by Over 2%			
	Entry Occurs	Consumer Welfare Increases	Total Welfare Increases	Average Price Decreases	Entry Occurs	Consumer Welfare Increases	Total Welfare Increases	Average Price Decreases
2	.812	.699	.431	.374	.990	.779	.421	.372
5	.567	.455	.210	.187	.895	.684	.290	.279
10	.270	.171	.031	.044	.590	.382	.054	.105
25	.051	.011	.014	.001	.126	.028	.005	.003

Tables VIII and IX present the net price effect of the simulated mergers. The results are presented both including the entrant in the average price calculation and excluding it. The latter calculation may be of greater interest because the entrant's price can be high or low compared with the average of incumbents' prices as a consequence of the random selection demand and cost parameters for the entrant. Most importantly, if the entry hurdle is as high as 25%, these tables show that the price effects are quite close to those with an infinite entry hurdle.

Finally, we consider two specific, albeit hypothetical, mergers. In an earlier paper, we (Werden and Froeb [1994, pp. 417–19]) presented logit Bertrand simulations of the price and welfare effects of hypothetical mergers of U.S. long distance telephone carriers *as of 1991*.[23] We now modify that experiment to include a potential entrant with the same cost and demand parameters as the smaller merging firm. The merger of MCI and Sprint ($\Delta HHI \approx 300$) would increase the quasi-rents of the potential entrant by only 3.0%, which would be unlikely to induce entry, but entry would render the merger unprofitable. The much larger merger of AT&T and MCI ($\Delta HHI \approx 1900$) would increase the quasi-rents of the potential entrant by 18.3%, which might be sufficient to induce entry. If entry were induced, the net effect of the merger and entry would be an increase in the share-weighted industry average price of 1.5%, and total welfare would be decreased if the sunk entry costs were as much as a third of the premerger entrant quasi-rents. Further, the net effect of the merger and entry would be to decrease the combined profits of AT&T and MCI by 8.3%. Exceptional economies would be necessary to induce the merger if the entry was anticipated, and economies of such a magnitude could be sufficient to yield a net welfare increase.

[23] The impact of the many resellers is incorporated through the inclusion of three very small fringe competitors.

TABLE VIII
MEAN AND MEDIAN PERCENTAGE PRICE INCREASES
RESULTING FROM SIMULATED NON-NESTED LOGIT BERTRAND MERGERS

Entry Hurdle Quasi-Rent Percentage	All Mergers				Mergers Increasing Average Price by Over 2%			
	Including Entrant		Excluding Entrant		Including Entrant		Excluding Entrant	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2	0.58	0.37	0.75	0.42	1.42	1.17	2.13	1.72
5	0.84	0.54	0.96	0.57	2.11	2.1	2.67	2.4
10	1.07	0.6	1.13	0.6	3.13	2.64	3.46	2.74
25	1.29	0.61	1.3	0.61	4.31	3.19	4.37	3.22
∞	1.34	0.61	1.34	0.61	4.59	3.27	4.59	3.27

TABLE IX
MEAN AND MEDIAN PERCENTAGE PRICE INCREASES
RESULTING FROM 1000 SIMULATED NESTED LOGIT BERTRAND MERGERS

Entry Hurdle Quasi-Rent Percentage	All Mergers				Mergers Increasing Average Price by Over 2%			
	Including Entrant		Excluding Entrant		Including Entrant		Excluding Entrant	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2	–0.01	0.16	0.52	0.37	1.01	1.46	1.02	0.99
5	0.58	0.46	0.97	0.64	2.78	2.67	1.63	1.31
10	1.40	0.95	1.61	1.10	2.30	2.14	2.83	2.32
25	2.21	1.41	2.26	1.46	4.29	3.52	4.42	3.67
∞	2.42	1.48	2.42	1.48	4.81	3.86	4.81	3.86

VI. CONCLUSION

The merger case law appears to presume that entry, or the threat of it, normally will cure or prevent anticompetitive effects from mergers. That presumption is not justified by the foregoing analysis of the entry-inducing effects of mergers in Cournot and Bertrand industries. While entry may occur, it is quite plausible that the opportunity for entry created by a merger is insufficient to induce entry, even when the merger is substantial and there are no Stiglerian "barriers to entry."

When, in our simulations, a Bertrand merger does induce entry, it renders the otherwise profitable merger unprofitable for the merging firms. Cournot mergers are normally unprofitable even without entry and are even more so with entry. If these models are useful policy guides, and firms are rational and informed, they merge only if they expect significant efficiencies generated from merger, or they perceive substantial entry obstacles such as sunk costs.[24] Consequently, the entry issue in merger cases can be collapsed into considerations of efficiencies, and in the absence of strong evidence that an otherwise anticompetitive merger generates significant efficiencies, there is a sound basis for presuming that entry obstacles will prevent entry in response. Thus, the best way for courts to treat entry in many merger cases may be not to consider it at all.

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[24] Efficiencies affecting marginal costs also affect prices and entrant quasi-rents. Thus, efficiencies may be part of what deters entry.

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