

## Paper Trail: Working Papers and Recent Scholarship

**Editor's Note:** In this edition we note a recent paper by Barry Nalebuff that relies on the envelope theorem to show that a monopolist can increase its profits by bundling the monopolized product with a competitively supplied product, even when the monopolist continues to offer the products separately.

Send suggestions for papers to review to: [page@law.ufl.edu](mailto:page@law.ufl.edu) or [jwoodbury@crai.com](mailto:jwoodbury@crai.com).

—William H. Page and John R. Woodbury

### Papers and Summaries

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**Barry Nalebuff, Bundling as a Way to Leverage Monopoly,**  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=586648](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=586648)

In this paper, Professor Barry Nalebuff, of the Yale School of Management, argues that a monopolist can *usually* increase profits by offering consumers a monopolized product at a discount in return for their agreement to purchase a second, competitively supplied product at a premium. He points out that the famous Chicago School refutation of simple leveraging (i.e., that the monopolist can gain no more than the full monopoly profit on the monopolized product, because consumers will pay no more than the unbundled price for both) depends on the products being used in fixed proportions. He thus characterizes the Chicago argument as addressing only a special case. In the more general case of variable proportions, the monopolist can increase profits by what he calls “mixed tying.”<sup>1</sup>

Others writers, of course, have shown that *forced* tying can increase monopoly profits. The best-known example is Bowman's demonstration that tying with variable proportions can be used to discriminate in price by metering the intensity of various buyers' demands, and extracting more of the inelastic demanders' consumer surplus. Nalebuff goes beyond this literature to show that a form of bundling can increase monopoly profits, even if the monopolist continues to offer the products separately at the original prices.

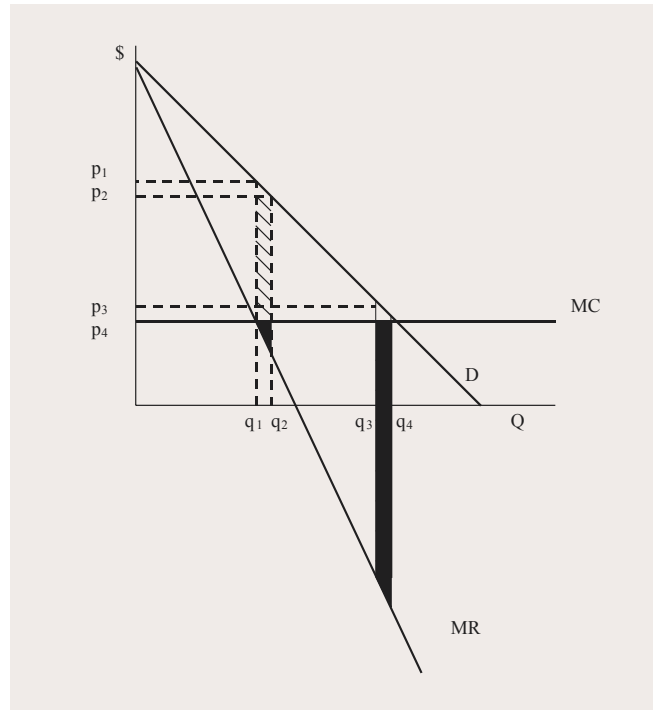
The key to understanding Nalebuff's argument is the envelope theorem, which points out an important implication of ordinary price theory: if a monopolist is charging the full monopoly price for a product, a small reduction in price will cause only a trivial reduction in monopoly profits, but a much larger increase in consumers' surplus and in allocative efficiency. When the price is at that region of the demand curve, marginal revenue is high and positive. Consequently, the reduction in revenue attributable to the sale of inframarginal units at a slightly lower price is almost completely offset by

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<sup>1</sup> In note 3, Nalebuff offers this term as a compromise between “bundling” or “tying.” Bundling usually means a package sale in fixed proportions, typically at a single price. Nalebuff's model, in contrast, requires that the products be sold *both* (1) tied, but in variable proportions, with the tying product sold at below the full monopoly price and the tied product sold at above the competitive price, and (2) separately, with the monopolized product sold at the full monopoly price and the competitively supplied product sold at the competitive price.

the increased revenue attributable to the sale of marginal units. Moreover, because consumers represented at that region of the demand curve value the product highly, the sale of the additional units together with the price reduction on inframarginal units causes a substantial increase in consumer surplus. If, in contrast, the monopolist is only charging a small increment above the competitive price, then a reduction to the competitive price will sacrifice all monopoly profits, but will cause only a trivial gain in total welfare.

Those who find diagrams helpful may wish to consider the following one from *Letter from William Page to Ian Ayres*, 17 MISS. COLL. L. REV. 92 (1996):



The monopolist maximizes profit at the price and output combination, here  $(p_1, q_1)$ , that corresponds to the point at which marginal cost (MC) is equal to marginal revenue (MR). For a small price reduction from the profit maximizing monopoly price  $p_1$  to  $p_2$ , output expands from  $q_1$  to  $q_2$ . The value of those additional units to consumers is given by the area under the demand curve (D) between  $q_1$  and  $q_2$ ; the cost of producing those units is given by the area under MC. Consequently, the deadweight welfare loss from monopoly decreases by the shaded area between D and MC and between  $q_1$  and  $q_2$ . Consumers gain an amount equal to the area between  $p_1$  and  $p_2$ , and to the left of D.<sup>2</sup> But the sacrifice in monopoly profit is only the small darkened triangle between MC and MR between those levels of output.<sup>3</sup> This disparity between the loss to the monopolist and the gains to consumers and to overall social wealth is the central insight of the envelope theorem.

<sup>2</sup> This amount is larger than the increase in allocative efficiency by the area of the small darkened triangle. Thus, the gain to consumers is equal to the sum of the shaded area below D and the darkened triangle, although it is actually the inframarginal consumers who receive most of the gain.

<sup>3</sup> The area under MR between  $q_1$  and  $q_2$  is the addition to total revenue attributable to the new units of output, while the area under MC is addition to total cost from the same units; the difference is the loss in profit attributable to the price reduction.

For a price change from  $p_3$  to  $p_4$  (the competitive price), however, total welfare increases only by the small triangle between D and MC and between  $q_3$  and  $q_4$ .<sup>4</sup> But the loss in profit to the monopolist is the much larger darkened area between MC and MR and between those levels of output.<sup>5</sup>

Ian Ayres has suggested that the envelope theorem implies that antitrust policy should focus on deterring monopolists from extracting the last increment in monopoly profits. See Ian Ayres, *Pushing the Envelope: Antitrust Implications of the Envelope Theorem*, 17 MISS. C. L. REV. 21 (1996). Nalebuff uses the theorem differently, showing that the disparity between the loss to the monopolist and the gain to consumers gives the monopolist an opportunity for profit: “a monopolist in A facing competition in B” can make a Pareto-improving price offer to consumers, proposing to reduce the price of A in return for the consumers’ agreement to buy all of their requirements of B from the monopolist “at an inflated price.” Nalebuff offers a mathematical proof, but the intuition is (again, from the envelope theorem) that the monopolist’s reduction in the price of A has little effect on its profits, because consumers will buy more of A at the slightly lower (but still high) price; because consumers gain significantly by the increased sales of A at a lower price, they are willing to pay the premium on B, so the monopolist comes out ahead.

Nalebuff then asks:

What about the Chicago argument that there is only one monopoly profit? The answer is that the monopoly in A is inefficient. If it is possible to reduce the inefficiency (which is the result of lowering the monopoly price below  $m$  [the profit maximizing price,  $p_1$  in the diagram, *supra*]), then the total pie is bigger. If the monopolist can find a way to get some of that extra surplus (say by raising the price in good B), it can make more than the regular monopoly profit.

As this explanation indicates, the antitrust policy implications of Nalebuff’s point are unclear. The monopolist and consumers both gain, and social welfare increases, so it would appear that under any criterion, the net effect of “mixed tying” is beneficial. (Indeed, as I noted above, Ian Ayres has argued that antitrust should seek to *encourage* monopolists to produce those marginal units beyond the monopoly output.) Nevertheless, Nalebuff suggests that the exclusion of competitors incident to bundling may have a long-run negative effect if the market for B becomes non-competitive and reentry by competitors is difficult. He concedes, however, that calculating the long-run welfare effects would require “a dynamic model of competition” that neither he nor anyone else has yet provided.<sup>6</sup> Nalebuff correctly concludes that the “ability of a monopolist to extend its influence to adjacent markets is a challenge both to the competitors in those markets and to economists looking to understand the antitrust implications of bundling.”

—WHP

<sup>4</sup> Again, the cost of producing the additional units between  $q_3$  and  $q_4$  is the area under MC; the consumer valuation of those units is the area under D; and the increase in consumers surplus is the difference.

<sup>5</sup> It costs the monopolist an amount equal to the area between MC and the  $q$  axis to produce those additional units, and the monopolist actually reduces its total revenue by an amount equal to the area between the  $Q$  axis and the MR curve. The loss in profit is the sum of these areas.

<sup>6</sup> For some dynamic models of tying see Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837 (1990); Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON. 194 (2002); Jay P. Choi & Christodoulos Stefanadis, *Tying, Investment, and the Dynamic Leverage Theory*, 32 RAND J. ECON. 52 (2001).