

# **A Theory of Post-Producer Commodity Bundling: Professor Hirshleifer Meets Professor Becker\***

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## ABSTRACT

This paper advances a theory of commodity bundling as an alternative to forward integration into home production. We argue, in particular, that a producer having market power over the sale of a final consumption good will sometimes find it profitable to bundle that good with one or more complements – and to sell the preassembled package to consumers at a lump-sum price – for the same reason that a monopolist of an intermediate input profits from integrating his supply chain. In both cases, substitution against a monopoly-priced product is avoided by restoring competitively determined input ratios downstream. Marrying the theories of transfer pricing and household production also provides novel insights into the not uncommon practice of “mixed bundling”, whereby sellers offer the same final consumption good both bundled and unbundled.

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# A Theory of Post-Producer Commodity Bundling: Professor Hirshleifer Meets Professor Becker

[T]he states argued in a filing with the court yesterday that Microsoft could indeed offer a version of Windows without binding such programs as music and video players and instant messaging to the operating system, shutting out competitors. (Kulish 2002, p. B6)

## I. Introduction

Commodity bundling is pervasive. From a McDonald's Happy Meal<sup>®</sup> to personal computers pre-loaded with an operating system, a web browser and a media player, consumers are confronted daily with take-it-or-leave-it offers requiring them to purchase bundles of products preassembled for them or nothing at all. In some cases, such as automobiles, which contain thousands of parts and components, these bundles include products that, for technological or practical reasons, cannot be sold separately (Adams and Yellen 1976, p. 475). In other cases, sellers engage in so-called mixed bundling, offering the same goods separately as well as in packages (*ibid.*). Restaurants, for example, frequently offer diners the option of choosing from a *prix fixe* menu, containing a list of entrees served with a salad, a vegetable and a starch, or ordering à la carte. Apples and oranges are sold loose by the pound as well as by the bag. Uncountably many consumer goods come ready to use, pre-made, or as a package of things combined in fixed proportions.

Our research plan here is to offer a new and novel insight into bundling which is essentially a marriage of the transfer pricing theorem and the modern theory of household production. Consider a simple example. Suppose that a consumer buys five items,  $x_1, x_2, \dots, x_5$ , in the optimal proportions and combines them *at home* using household labor to make  $z_1$ , a Beckerian final consumption good (Becker 1965). These items could be the inputs – flour, eggs, milk, butter, and sugar – required to make a cake. Assume, for simplicity, that each of the  $x_i$  goods costs \$1 per unit, that these goods are produced and sold in competitive markets, and that one unit of each input is used to make one unit of output  $z_1$ , at this set of prices. Also imagine that eggs and sugar can be substituted for butter, over some range, to yield cake. Now consider that a monopoly is formed in the butter industry. The price of butter, hypothetically, increases to \$2 per unit. Cooks, at home, substitute eggs and sugar for butter. The monopoly profits of the butter producer are less than they would be in the absence of such substitution. The transfer pricing theorem (Hirshleifer 1956) tells us so. Moreover, there is an additional welfare loss associated with the monopoly output restriction owing to consumers' using

an inefficient mix of inputs for making cake. Can the new butter monopolist prevent the adverse selection against his product that follows from cooks shifting out of butter and into eggs and sugar? Under many conditions, yes, by assembling bundles containing one unit each of the five ingredients and charging a price of \$6 for a pre-boxed cake mix. Input proportions can no longer be altered. While the usual deadweight loss from monopolization of the butter industry still exists, it is not reinforced by the distortion caused by consumers using less butter and more sugar and eggs.<sup>1</sup> Professor Hirshleifer, meet Professor Becker.

The different perspective on the common practice of commodity bundling offered here suggests that this selling strategy can be thought of as a substitute for vertical integration into final consumption. Sellers enjoying market power in the sale of one or more final products will sometimes find it profitable to assemble these commodities into bundles containing other, competitively supplied complementary products for the same reasons that intermediate product monopolists sometimes find it profitable to integrate forward into the manufacture of final products. Commodity bundling, in other words, overcomes distortions in relative prices that, if complementary goods were sold separately, would prompt consumers to purchase them in less than optimal combinations. The suboptimal combinations of final products chosen by consumers on ordinary offers are displaced by all-or-none offers of commodity bundles assembled for them that are optimal from the points of view of both the seller and the typical buyer.

The transfer pricing theorem has to date been applied only to intermediate product markets, stopping short of the line between final product producers and final product consumers, a line that is analytically convenient, but wholly arbitrary.<sup>2</sup> The boundaries of the firm are porous (Coase 1937). If consumers combine their own time with other inputs obtained on the market, they will choose inefficient input mixes unless all of the market goods are sold at prices equal to marginal cost. Monopolists can restore efficient input combinations in home production if they can bundle their

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<sup>1</sup> The monopolist could not, of course, continue to offer butter for sale separately. We return to this point later in the paper.

<sup>2</sup> Some authors (e.g., Robinson 1996) have modeled vertical integration as a solution to the monopoly waste linked with transferring goods at prices above marginal cost. Our extension is to suggest that bundling is a way of solving that problem when vertical integration is impractical.

monopoly good with the other market inputs entering the household's production function.

The Federal Trade Commission's "Funeral Rule" exemplifies our hypothesis of commodity bundling as forward integration into home production. Among other things, that rule, which went fully into effect on April 30, 1984, required funeral homes to unbundle the components of traditional funeral services (embalming, caskets, flowers, and so on) formerly sold in fixed-price packages of varying quality. Because the directors of funeral homes were better able to select least-cost combinations of funeral products, freedom to make their own choices arguably made consumers worse off (McChesney 1990) and, we would add, because there is local monopoly in the supply of disposition of remains, consumers who can pick and choose their own funeral inputs would be expected, ultimately, to spend more overall on the unbundled items than they did for the previously available funeral packages. That is what the evidence in fact shows. Subsequent efforts by parties not subject to the rule (crematories and casket manufacturers) to restore package pricing by vertically integrating into the provision of funeral services demonstrates the efficiency of commodity bundling and the vitality of countervailing market forces.

Vertical integration into home production is not here claimed to replace existing economic theories of commodity bundling. When sellers combine separately priced complementary final products into packages, surely they may in the process extract additional consumer surplus, reduce transaction costs, reallocate risk, or improve inventory management. The observation that commodity bundling also corrects distortions in the combinations of final products purchased by consumers simply contributes an additional efficiency rationale to the literature.

The paper is organized as follows. Section II places our argument in context. We next summarize the theory of vertical integration as it applies to intermediate product markets (Section III) and then extend it to home production (Section IV). Four empirical examples of commodity bundling as a substitute for forward integration into final consumption are also presented in Section IV. Additional theoretical considerations are addressed in Section V. Section VI concludes.

## II. Context

In an older way of thinking, pure commodity bundling was seen as a way for a firm enjoying a monopoly of one product to extend that monopoly to the market for another. But that explanation failed the test of simple economic logic (Stigler [1963] 1968). Any attempt to extract additional profits by raising the price of a second good bundled with – or tied to – the monopolized good would shatter on the first law of demand. The seller could not continue to sell the same quantity of the latter without lowering its price: if the second good includes an overcharge, the monopolized good must be priced below the simple monopoly price (Kenney and Klein 1983, p. 498).

Schooled in extension-of-monopoly's fatal logical flaw, the modern economic literature on commodity bundling – if not necessarily, as this paper's epigraph suggests, its application within the realm of antitrust – initially shifted the analytical focus toward theories of price discrimination. Metering was offered as a theory (Director and Levi 1956).<sup>3</sup> If the elasticity of demand for the services of a durable good, such as a photocopier, is inversely correlated with the user's consumption of complementary inputs, such as paper, toner cartridges, replacement parts and maintenance services, then by bundling some or all of these inputs with the sale or lease of the photocopier, a durable-goods monopolist can extract more surplus from consumers than could be extracted under alternative pricing policies.<sup>4</sup> Such price-discriminatory metering requires the monopolist to lower the price of the durable good (below the simple monopoly profit-maximizing price) and to raise the prices of the complementary inputs over what would be charged for them if sold separately. That strategy enables the monopolist to charge higher effective prices to consumers who use the durable good more intensely and, hence, purchase larger quantities of complementary inputs than their counterparts whose demands are more elastic.<sup>5</sup> In effect, bundling offers the firm a transparent way of separating its customers into high and low elasticity demanders, with the demanders themselves segmenting the market.

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<sup>3</sup> An early formal treatment of the problem in which metering is seen as a special case of profit extraction through all-or-nothing offers is contained in Burstein (1960a).

<sup>4</sup> See *International Business Machines Corp. v. United States*, 298 U.S. 131 (1936).

<sup>5</sup> Burstein (1960b, p. 71) insightfully describes how tying arrangements in the form of contracts requiring the users of a durable machine to purchase complementary inputs from the machine's producer "can achieve the effects of variable rental (open-end lease) arrangements".

Bundling or tying ensures that those gains in fact materialize. Only by requiring customers to obtain their requirements of complementary inputs directly at the origin can the durable good's producer profitably charge less than the monopoly price, capture the cost savings, if any, from dual distribution, or both (Peterman 1979).

A second theory of price discrimination recognizes that consumers differ in their valuations of the individual goods included in a commodity bundle (Adams and Yellen 1976). By averaging these differing valuations and charging a single price at which some elements of the package are undervalued and others are overvalued, but at which average value is equal to average price, the seller can, by making an all-or-nothing offer, convert consumer surplus into additional profit. Other theories of commodity bundling emphasize the transaction-cost savings associated with avoiding duplicative search (consumers do not need to repeat the steps taken by the seller in assembling the bundle) and of haggling over the prices of the individual items (Kenney and Klein 1983). Risk-sharing may explain other instances of commodity bundling, such as the now illegal practice of block booking in the motion picture industry (*ibid.*). Considerations of optimal inventory management supply yet another rationale: if items of varying quality are sold individually at the same price per unit, consumers rationally will select only those units they deem worth more than their price. Overvalued units will be bypassed and the average quality of the seller's remaining inventory necessarily will fall. Such adverse selection can be averted by assembling packages containing units of varying quality and selling the bundles at an average price that corresponds to average quality (*ibid.*; Barzel 1982).<sup>6</sup>

### **III. Commodity Bundling in Intermediate Product Markets**

As Meyer Burstein (1960b, p. 62) cogently put it, "there are few circumstances in which a firm with monopoly power over a good used as an input in some economic process does not have an incentive to vertically integrate that process...." Two circumstances in particular are emblematic of that incentive and, as such, provide fodder for standard expositions of the welfare effects of ownership

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<sup>6</sup> Put differently, bundling may eliminate duplicative and unproductive investment in information which in its absence could lead to wealth loss and inefficiency. In effect, this selling practice solves, reduces or eliminates the unproductive investment in information by eliminating individual inspection of the items in the bundle (Barzel 1982).

integration between input and output markets (e.g., Blair and Kaserman 1985, pp. 295–304; Shughart 1997, pp. 494–506).

Consider, first, the case of double markup. Assume that an intermediate input,  $I$ , is employed in the production of some final product,  $F$ . Assume further that the input-output ratio is fixed so that, for example, the manufacture of one unit of  $F$  requires exactly one unit of  $I$ . Now if both  $I$  and  $F$  are sold in imperfectly competitive markets (that is, their prices exceed corresponding marginal production costs), the deadweight welfare loss associated with the monopoly output restriction at one stage of the production process impairs profitability at the other. Profits can be increased if the producer of  $F$  integrates backward into the production of  $I$  and replaces market purchases of  $I$  at price greater than marginal cost with internal-to-the-firm transfers at price equal to marginal cost. (A similar incentive exists for the producer of  $I$  to integrate forward into the production of  $F$ .) Such a reduction in the price of the intermediate input lowers the cost of producing the final product. That cost reduction, in turn, enables the vertically integrated firm to expand the production of  $F$ , to reduce its price, and, by more effectively exploiting market power on sales to final consumers, to earn more profit than before. Because more  $F$  is made available at a lower price, consumers are likewise better off with vertical integration than without.<sup>7</sup>

Similar conclusions follow *a fortiori* when the final product is manufactured according to a variable-proportions production technology. Suppose that that technology allows the final product,  $F$ , to be produced with two or more inputs which are good, but not perfect substitutes for one another. Let one of these inputs, say input  $A$ , be manufactured and sold to the final product's producers by a supplier who enjoys market power, while the others can be purchased at prices equal to their respective marginal costs of production. The least-cost input combination for producing  $F$  predictably contains less of  $A$  and more of the other inputs than would be the case if  $A$  was also sold at a price equal to marginal cost. Substitution in favor of these other inputs supplies an incentive for the producer of  $A$  to integrate forward into the production of  $F$  (or for the  $F$ -producers to integrate backward into the production of  $A$ .) By again replacing market purchases of  $A$  at price greater than

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<sup>7</sup> With a markup at only one stage of the supply chain, by contrast, nothing is gained by vertical integration. In that case, a monopoly of an input is as good as a monopoly of an output.

marginal cost with internal-to-the-firm transfers at price equal to marginal cost, the cost of producing  $F$  is reduced. The vertically integrated firm achieves greater profits by virtue of the fact that its final product division confronts a set of input prices that reflect the true, social opportunity costs of resource use. It accordingly selects the socially optimal combination of inputs for producing  $F$  rather than the suboptimal, less- $A$ -intensive input combination chosen prior to ownership integration of successive stages of production.

The moral of the story is that overcoming input-price distortions affords opportunities for firms to increase their profits through vertical integration. Put differently, the transfer-pricing theorem instructs firms, whenever possible, to collect their profits on sales of final products rather than on sales of intermediate inputs. Any attempt to exploit market power at earlier stages of the production process by selling an input at a price greater than marginal cost prompts purchasers to substitute away from that input, thereby compromising production efficiency at the next and at all subsequent stages of the supply chain. Carried downstream, these distortions ultimately raise the cost of producing the final product, reduce the quantity of it produced, and, hence, limit the derived demands for all inputs and the profits of their suppliers, including those with market power.

A desire to control input substitution thus provides one of many profit motives for vertical integration. That organizational solution is not always the most cost-effective one, however. Fortunately, alternative strategies are available to firms for capturing the benefits of vertical integration without bearing all of its costs. One of these alternatives is the tie-in sale (Blair and Kaserman 1978, Shughart 1998). By conditioning the sale or lease of  $A$  (the monopolized input) on purchases of one or more otherwise competitively supplied complementary inputs, the producer of  $A$  can adjust relative prices in such ways that downstream firms choose the same input combination the monopolist would employ if he integrated vertically into the production of  $F$ .

Generally speaking, those adjustments entail lower prices for  $A$  and higher prices for complementary inputs than the customers of the monopolist would pay in the absence of tying. Depending on the elasticity of demand for the final product and the elasticities of substitution between the tied inputs and other factors of production employed downstream, the quantity supplied of  $F$  may rise or fall,

with corresponding effects on final product price. But even in the latter case, where the tying arrangement leads to a reduction in the output of  $F$  and an increase in its price, an overall assessment of the social welfare consequences of tying requires weighing the losses of consumer surplus against the production efficiency gains associated with restoring optimal input combinations downstream.<sup>8</sup>

#### IV. Commodity Bundling in Home Production

Consumers frequently combine final products for the purpose of producing some further good or service in much the same ways that firms combine inputs to produce final products. They engage in the home production of Beckerian  $z$ -goods (Becker 1965) composed of various mixes of their own time and one or more market goods. In arranging a loved one's funeral, for example, the survivor must secure the services of a mortician to prepare the dearly departed for burial or cremation, must purchase a casket or urn, must schedule a funeral service and engage a minister, priest or rabbi to conduct it, must select flowers and music, and must see to the proper internment of the bodily remains, including the erection of an appropriate headstone, monument, or commemorative plaque. Perhaps what is more important, the buyer *organizes* all these affairs in some timely and appropriate manner. The same is true of computer operating systems and the software application programs necessary for users to browse the web, to download and replay music and video clips, to communicate by email, to analyze data, and to create documents. If sold separately, purchasers are free to assemble these goods and services in a wide variety of combinations that differ with respect to quality and price. Given freedom to choose, rational consumers will tend, other things being the same, to economize on the relatively expensive elements of the set of complementary final products entering the household production function, substituting in favor of those that are lower priced. And, as Becker showed us, individuals differ in their abilities and capacities to assemble these bundles of final consumption goods. Human capital varies across people.

The producer of a final product sold in an imperfectly competitive market is thus in the same

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<sup>8</sup> The classic papers here are Vernon and Graham (1971), Schmalensee (1973) and Warren-Boulton (1974). Westfield's (1981) exhaustive analysis suggests that, even in the extreme case where an input monopolist acquires *all* of the producers of the final product, vertical integration more often than not leads to an increase in final product output, to a reduction in final product price and, hence, to an improvement in consumers' (and society's) welfare. Insofar as they function as alternatives to vertical integration, it seems reasonable to draw similar conclusions about tying and bundling. After all, the input monopolist engages in tying so as to sell more of  $A$ , not less of it.

position in relation to consumers who use that product to produce a  $z$ -good as an input monopolist is in relation to the firms who use that input to produce a final product. In both cases, market price signals cause purchasers to employ less than optimal amounts of the monopolist's product and too much of all other inputs, including his or her own time, investment in human capital and relevant market goods. Just as the input profits of a monopolist can be increased through actions that restore competitively determined input-price ratios in the final product industry, the final product profits of a monopolist can be increased by controlling input substitution in the production of  $z$ -goods. Exercising this control requires implicitly adjusting the relative prices of the final products employed in home production so that consumers use the same mix of inputs they would have used had all of them been available at prices equal to marginal cost, and exorcizes the waste from inefficient input proportions.

Forward integration into home production is one way of solving the final product monopolist's problem, but it is not an option that is feasible. Adverse substitution by consumers against the monopolist's final product can be mitigated, however, by bundling that product with one or more other complementary goods in proportions that are optimal (profit-maximizing) from the monopolist's point of view. The monopolist then makes consumers an all-or-none offer at a lump-sum charge tailored to replicate competitively determined price ratios. Once again, the appropriate strategy combines an implicit reduction in the price of the monopolist's final product with implicit increases in the prices of the complements included in the bundle.

Commodity bundling fixes input ratios optimally. It is worth stressing, however, that once the bundle has been assembled and a profit-maximizing package price has been determined, the prices of the individual elements of the package are no longer relevant to consumers' purchase decisions. If, for example, a web browser is bundled with a computer operating system and the software package is sold for \$200, it does not matter whether the seller advertises that the \$200 operating system includes a browser at no extra charge, that the operating system is free when buyers purchase a \$200 browser, or that each costs \$100. Any pair of individual prices that sum to \$200 is equally possible. Relative prices are determined by the seller in an implicit sense when the package price is set, but the seller's key objective is to avert substitution against one or more goods included in the

bundle that, if sold separately, would be priced above cost. This is done by assembling the elements of a commodity bundle in the same proportions a monopolist of one of the complementary goods would employ if vertical integration into household production were practical.

By confronting consumers with implicit relative final product prices that are the same as if all the elements of the package were sold at prices equal to marginal cost, commodity bundling thus achieves the same efficiencies attributable to vertical integration at earlier stages of the production process. In cases where consumers are imperfectly informed about the performance characteristics of the various complements that potentially can be combined with the monopolist's product to produce a *z*-good, commodity bundling also enables the seller to bring his expertise to bear in assembling packages that exhibit varying mixes of quality, functionality and compatibility consistent with price. Consumers' search and information-gathering costs are thereby reduced (Barzel 1982). Welfare increases. Four examples illustrate.

#### **A. The Federal Trade Commission's Funeral Rule**

Prior to the promulgation of the Funeral Industry Practices Rule, 16 C.F.R. Part 453 (1988),<sup>9</sup> of the Federal Trade Commission (FTC), funeral providers frequently engaged in commodity bundling. Although many funeral directors continued to make itemized price information available to their customers (McChesney 1990, p. 17), the industry was moving increasingly in the direction of supplying full-service funeral packages characterized by "unit" (package) pricing of pre-selected combinations of the various goods (e.g., caskets and outer burial containers) and services (e.g., embalming) comprising the traditional funeral (*ibid.*, p. 20). On the eve of the Funeral Rule's effective date, slightly more than 36 percent of the funeral directors participating in a survey conducted by the FTC responded that unit pricing was the method they used most frequently for quoting funeral prices, a figure roughly equal to the fraction of consumers who, in a different pre-Rule survey, said they preferred that method of pricing (*ibid.*, p. 34).

Relying on theories of asymmetric information in transactions between hurried consumers "under

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<sup>9</sup> The rule was adopted on September 24, 1982, and became fully effective on April 30, 1984. See FTC, 16 C.F.R. Part 453, Request for Comments Concerning Trade Regulation Rule on Funeral Industry Practices, May 5, 1999.

the emotional strain of bereavement” (*ibid.*, p. 6) and better informed professional funeral providers, the FTC alleged that “the pricing methods which prevail in the industry” contribute to consumer ignorance, thereby allowing sellers “to charge higher than competitive prices” (*ibid.*, p. 7). Unit pricing in particular made it “impossible for consumers to learn the cost of any of the individual components of the funeral package and to select individual items after considering their relative costs” (*ibid.*). Moreover, “package pricing leads consumers to buy items they may not want or use.... By bundling all of the pre-selected goods and services together, the funeral provider is effectively forcing the consumer to buy items as a condition of providing a necessity that only he can provide: disposition” (*ibid.*, p. 8).

To correct that perceived market failure, the Funeral Rule required providers to unbundle their preassembled funeral packages. It did so by prohibiting funeral directors “from requiring that certain goods or services be purchased as a condition for receiving other goods and services” and by requiring them to furnish consumers with “casket and outer burial container price lists, a general price list at the beginning of discussions ..., and a final statement of the goods and services selected at the end of discussions” (*ibid.*, p. 5). Itemized price information was also to be made available by telephone (*ibid.*).<sup>10</sup>

The theory of commodity bundling as a substitute for forward integration into home production suggests that consumers were harmed by the Funeral Rule. That is what the data in fact show. A before-and-after study by the FTC’s Bureau of Economics, which examined the change in real consumer spending on funerals between 1981 and 1987, found that “spending on the average funeral rose by 9.1 percent, or \$223 ...” (*ibid.*, p. 49). Part of this statistically significant increase in spending can be attributed to the higher costs of funeral providers, who are now obliged to spend more time with consumers explaining the options to them, comparing prices and finalizing arrangements (*ibid.*, p. 50). The Rule also seems to have caused spending to rise in part by forcing consumers to micromanage their own funeral packages rather than allowing them to delegate this

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<sup>10</sup> The Funeral Rule contains other provisions not relevant to the present discussion. These include prohibitions on various “misrepresentations about embalming, caskets for cremation, outer burial containers, legal and cemetery requirements, preservation and protection of bodies, and cash advances”. Funeral providers are further “prohibited from embalming for a fee without prior approval (with a certain number of exceptions)” (quoted in McChesney 1990, p. 5).

responsibility to funeral providers, who, owing to experience, arguably are better positioned to pre-select cost-effective bundles of funeral products. Pre-Rule survey data point to the conclusion that more often than not funeral “package prices in fact were lower than itemized prices for the same bundle of goods and services. The average difference was \$167” (*ibid.*, p. 52).

The Funeral Rule applies only to the providers of “traditional funerals”. Crematories were not subject to the Rule; neither were the specialized manufacturers of caskets and other funeral products nor the owners of cemeteries and other final resting places (*ibid.*, p. 67). In the wake of the Rule’s promulgation, some of these exempted parties began integrating vertically into the provision of funeral services and to engage in unit pricing. Fifteen years on, when the FTC solicited public comments on the advisability of reauthorizing the Funeral Rule, traditional funeral providers argued strenuously that it should be modified to cover the previously exempted parties (see, e.g., National Selected Morticians 1999). These developments suggest that commodity bundling of funeral goods and services produces significant efficiency benefits for both sellers and buyers.

## **B. The Microsoft Case**

The attorneys general of 19 states and the District of Columbia joined the U.S. Department of Justice’s antitrust complaint alleging that the Microsoft Corporation had unlawfully abused its dominant position in the market for Intel-compatible PC operating systems. In particular, the Justice Department charged that Microsoft’s practice of bundling Internet Explorer with its Windows operating system violated the Clayton Act’s proscription on tying arrangements whereby the sale of one product is conditioned on the purchase of another. By requiring purchasers of the Windows operating system to also buy its web browser, Microsoft had, according to the government, leveraged its market power in operating systems to foreclose rival Netscape from distributing its browsing software product, Navigator. Not only did Microsoft’s selling strategy represent an unlawful restriction on consumer choice, but, given that Internet Explorer was included in Windows at no additional charge, bundling may, in the Justice Department’s opinion, also have been intended predatorily to drive Netscape from the browser market (see, e.g., Shughart 2000).

The Justice Department and Microsoft ultimately reached an agreement to settle the case. As the

endgame was being played out, however, nine of the states filed a brief objecting to the proposed settlement on the ground that it did not go far enough in curbing Microsoft's monopoly power. In particular, the attorneys general of the nonsettling states asked the court to order that Microsoft create and market a "single, uncommingled version of its operating system" – a version not bundled with Internet Explorer or any other so-called middleware product, such as a media player (Kulish 2002). Stripping Windows of middleware, which expose interfaces that potentially function as alternative platforms for running network-centric application programs (applications capable of running on a web server rather than on a computer's hard drive), would, according to the nonsettling states, succeed in breaking Microsoft's operating system monopoly by preventing the company from continuing to thwart the development of software applications designed to run on non-Windows platforms. The brief also argued that this type modification of Windows was technically feasible, implying that there was no reason beyond protecting its operating system monopoly for Microsoft to persist in bundling middleware with Windows (*ibid.*).

Microsoft contended that Internet Explorer and the other application programs packaged with the current version of its operating system are intimately bound together and, moreover, that the remedy proposed by the nonsettling states would cause Windows to be withdrawn from the market. The states responded "that Microsoft already offers a no-frills version of Windows without such add-on programs to commercial buyers who customize them for specific tasks" (*ibid.*). This dispute is beside the point. The theory of commodity bundling as a substitute for vertical integration into home production suggests that the packaging of one or more application programs with a PC operating system generates efficiency benefits both for Microsoft and its customers.

Those benefits materialize even though, in the case at hand, home production approximates the conditions of fixed-proportions technology: web browsing, for instance, requires one computer operating system and one web browser. Suppose, not contrary to fact, that both products are sold in imperfectly competitive markets at prices exceeding marginal cost. Owing to the complementary relation between them, the higher-than-competitive price of browsers reduces the demand for operating systems and prevents the operating system's producer from fully maximizing its profits. By bundling the two software products together and offering the package at a lump-sum price, the

operating system's producer can correct the distortion in relative prices occasioned by the exercise of market power on the part of browser producers. (This is the familiar problem of double marginalization in the theory of vertical integration.) Obviously, such a strategy pays – operating system sales and profits increase – only if, at the package price, the operating-system-cum-browser is less expensive than the two products would be if sold separately. The operating system's producer gains nothing by making his product more expensive; nor can he (implicitly) charge a price for the included browser that exceeds the marginal value the typical consumer places on it.

In addition to lower prices, consumers benefit from commodity bundling by avoiding the search and information-gathering costs they would bear in assembling packages of compatible PC operating systems and web browsers on their own. Moreover, when the bundled system crashes, they know whom to blame. Measurement costs are lower because duplicative, non-productive investment in information has been reduced.

### **C. Mickey Mouse Pricing**

Once upon a time, Disneyland engaged in two-part pricing (Oi 1971). Visitors were charged a fixed fee for entering the theme park and then paid separately for the various rides and attractions.<sup>11</sup> Perhaps recognizing that the marginal cost of serving additional customers is low relative to fixed cost, Disneyland's original pricing strategy subsequently was replaced by a single, lump-sum charge for admission to the park. Rides are now rationed by waiting rather than by explicit user fees.

More to the point, visitors to Disneyland (and to Walt Disney World) are offered the option of purchasing, through the Walt Disney Travel Company, fixed-price vacation packages which include admission to the park and hotel accommodations. The prices of these packages vary depending on the length of stay, the quality of the hotel room, and whether or not meals are included. Bundling overnight accommodations and food with admission to its parks enables Disney to structure the relative prices of these complementary final products optimally, thereby inducing its customers to

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<sup>11</sup> Included in the entry fee was a booklet containing a limited number and mix of tickets for use on the park's rides. Once this booklet had been consumed, the visitor could purchase additional tickets at booths located throughout the park. Ticket prices ranged from 10¢ for the least popular attractions (e.g., the carousel in Fantasy Land) to \$1 for the most popular (e.g., Pirates of the Caribbean).

choose efficient combinations that might not be chosen if the elements of the package were sold separately.

Klein, Crawford and Alchian (1978) have advanced an alternative theory of resort pricing which explains ownership integration in intermediate product markets as a means of controlling opportunistic behavior by input suppliers. In particular, they argue that if, say, a golf course and an adjacent hotel are independently owned, each owner will have an incentive to take advantage of the other. Even if the two parties have agreed ahead of time on a mutually profitable set of prices, after the investments necessary to build the resort have been made, the owner of the golf course can appropriate a disproportionate share of the location-specific rents by raising his greens fees and equipment rental charges; the owner of the hotel can behave similarly by raising his room rates and food prices.

According to Klein, Crawford and Alchian, post-contractual opportunistic behavior will be mitigated if the hotel and the golf course are jointly owned. Our theory of commodity bundling as a substitute for vertical integration into final consumption suggests that, even in the absence of ownership integration between the suppliers of complementary final products, trips to resort destinations will tend to be sold in fixed-price packages so that consumers purchase the optimal mix of vacation inputs.

#### **D. Maintaining Durable Consumer Goods**

Repair services and replacement parts are complements to a wide variety of durable consumer goods, including automobiles, household appliances and electronic equipment (fax machines, printers and scanners, and so on). If the inputs necessary to maintain a consumer durable in good working order are relatively cheap (i.e., available at competitive prices), the monopoly seller of such a good faces the prospect that final consumers opportunistically will extend the product's useful life – beyond that which is optimal from the seller's point of view – by “overinvesting” in maintenance effort.

How a monopolist who does not control the “after-market” for the durable good he sells will respond

to consumers' useful-life-extending activities is a matter of scholarly controversy. Early contributions to the literature suggested that the monopolist would alter his product's built-in durability inefficiently, although the direction of change remained ambiguous (Schmalensee 1974; Su 1975).<sup>12</sup> More recently, Shughart (1998) develops a model in which the monopolist shortens the durable good's built-in useful life in order to offset consumers' efforts to keep previously sold units in service longer than desired, thereby reducing the seller's profits from sales of new durables. Maloney (2000), on the other hand, predicts the opposite response, namely that the monopolist inefficiently will lengthen his product's built-in useful life.

Whether built-in durability increases or decreases in circumstances where replacement parts and repair services are sold in a market separate from that served by a durable goods monopolist, there is broad agreement that the inefficiency introduced by consumers' overinvestments in maintenance can be eliminated in one of two ways. The first of these is for the manufacturer of a durable good to adopt a lease-only policy and to specify in the rental contract the timing of replacement of units currently in use. The anniversary date of replacement is simply set equal to the end of the built-in useful life that is optimal from the lessor's point of view. Alternatively, the manufacturer of a durable good can choose to sell his product, but to condition sales on the purchase of repair parts and maintenance services also sold by him. By delimiting customers' choices in that way, the manufacturer can adjust the relative prices of the durable good and the after-market inputs – typically lowering the former and raising the latter – so that buyers opt to replace old units with new units on a schedule consistent with the optimal useful life determined by the seller.

A strategy of tying repair parts and maintenance services to the purchase of a durable good is not a perfect solution to the monopolist's problem. After a sale is made, buyers have an incentive to avoid paying higher-than-competitive prices for parts and service by obtaining those inputs from unauthorized sources. The manufacturer of a durable good sold in this way consequently must spend resources to prevent customers from using counterfeit parts and unapproved service organizations (Shughart 1998). In addition, the Magnuson-Moss Warranty/Federal Trade Improvement Act of

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<sup>12</sup> As Schmalensee (1979) put it, "no simple condition indicates whether built-in durability will be higher or lower [under monopoly] than under competition."

1975 makes it illegal for *sellers* to condition product warranties on customers' use of brand-name complementary inputs, thereby eliminating a low-cost enforcement mechanism and, in the process, causing warranty coverage periods to be briefer than otherwise (Eisenach, Higgins and Shughart 1984).

Be that as it may, tying (or bundling) otherwise competitively supplied repair parts and maintenance services to (or with) purchases of durable consumer goods provides a means by which the seller can fix the input ratios employed in the home production of a variety of Beckerian  $z$ -goods. In the absence of such after-market control, the built-in useful lives of many consumer products will tend to be inefficiently long or short, implying that social welfare has been compromised.

## **V. Additional Theoretical Considerations**

Consumers differ in their tastes and preferences for engaging in home production. Stocks of human capital and technological production coefficients, as Becker labeled them, for transforming market goods into  $z$ -goods also vary across people. These differences give rise to several generalizations about commodity bundling, some of which are obvious and certainly not new to us.

First, the impact of income on the full price of a home-produced Becker good is ambiguous. High-income consumers have higher opportunity costs of the time they must combine with market goods to produce  $z$ -goods, but also are more likely to have numerically larger technical coefficients of household production. It is therefore impossible to say whether rich or poor people will make or buy, that is, whether increases in income will tip the balance in favor of purchasing commodity bundles as opposed to buying market goods separately for assembly at home. When income is high due to very specific human capital skills, however, consumers will tend to buy and not make. The opportunity costs of time dominate in this case.

Second, the incidence of pure commodity bundling versus mixed bundling depends on the variance of technological production coefficients across consumers. When the variance is high, mixed bundling will dominate: consumers with low technological coefficients of home production will almost always purchase commodity bundles preassembled for them, while others having larger

technological production coefficients and, hence, comparative advantages in home production, will tend to buy the relevant market goods unbundled. Manufacturers enjoying monopoly power in one of these market goods will respond to this difference in skills by offering to sell their products both on a standalone basis and combined with otherwise competitively available complements. The market for funeral services provides a case in point. Prior to the promulgation of the FTC's Funeral Rule, funeral homes engaged in unit pricing to the same extent that consumers preferred that option. On the other hand, when the variance of skills across consumers is low, most will either make or buy, *ceteris paribus*, when confronting similar circumstances and input prices. In cases where home production demands few specialized skills and, moreover, differences in skill sets across consumers are small, little or no commodity bundling will be observed. Peanut butter and jelly sandwiches come to mind. Commodity bundling will be pervasive, however, when the technological expertise required for household production is comparatively scarce. Automobiles and personal computers come to mind.

By fixing the input ratios employed in household production functions, commodity bundling generates efficiency gains. A monopoly supplier of one complementary input thereby avoids substitution against his product. An important question is, who captures these gains? In the case of replacement parts and repair services bundled with the purchase of a durable consumer good, for example, Maloney (2000) shows that all of the gains associated with restoring efficient input mixes redound to the monopolist. In the case of funeral services, by contrast, the empirical evidence suggests that it was consumers who benefitted most from commodity bundling: spending on the average funeral rose significantly following the elimination of package pricing.<sup>13</sup>

No general conclusions about the gain-sharing associated with commodity bundling thus seem possible. Because the package price cannot exceed the summed market prices of the individual items included in the package plus the opportunity cost of the time consumers would otherwise devote to

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<sup>13</sup> The conclusion that consumers captured the lion's share of the gains from the bundling of funeral goods and services is reinforced by the opposition of traditional funeral homes to reauthorization of the FTC's Funeral Rule unless the rule was at the same time extended to nontraditional funeral providers. That stance suggests that the profits of traditional funeral homes are higher with itemized pricing than with unit pricing, an increase in profitability threatened by the entry of new, unregulated providers able to sell funeral services in fixed-price packages.

home production, circumstances exist for monopolists profitably to raise the prices of commodity bundles an epsilon below the level at which consumers would be induced to make rather than buy. That outcome seems more likely to materialize in market situations where pure commodity bundling is possible, that is, where the monopolized market good is sold only in packages containing one or more other complementary inputs. Those situations occur, to reiterate, when the skills required for home production are highly specialized and distributed sparsely across consumers, household time carries a high opportunity cost, or both. Commodity bundles are less likely to be higher priced than their individual components when the monopolist of a market good engages in mixed bundling, offering to sell his product both packaged and unpackaged. If consumers are afforded the option of buying the monopolized good independently or bundled with one or more complements, there is less scope for making the package more expensive. Mixed bundling would therefore seem to be amenable to explanation as a strategy for separating consumers into groups based on differences in their technological production coefficients, differences in their incomes, or both, and of charging different prices for the two options. As the funeral industry illustrates, price discrimination in favor of consumers who purchase commodity bundles seems the likely outcome in this case.

The welfare implications of commodity bundling, like those of vertical integration in intermediate product markets, requires a balancing of production efficiency gains against potential additional deadweight losses. As a final example of our argument, consider the ongoing debate about bundling in telecommunications. The so-called Baby Bells, the local telephone exchange suppliers, have long enjoyed territorial monopolies.<sup>14</sup> Following the deregulation of entry into long-distance telephony, consumers were confronted with a bewildering array of differently priced calling plans, making it difficult to assemble cost-effective bundles of local and long distance service. Thus, we expect that local telephone companies have an interest beyond the obvious in desiring to package the two types of telephone service. Indeed we note that most cellular phone companies have actually bundled local and long distance service into one inseparable package. Our analysis therefore suggests that there might be a deadweight loss from continued legal prohibitions severing local and long distance

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<sup>14</sup> Cellular and mobile phone competition and internet communications are to some extent competitors, albeit imperfect ones.

wireline telephony.<sup>15</sup>

## **VI. Concluding Remarks**

This paper has applied the theory of transfer pricing to suggest that commodity bundling amounts to vertical integration into final consumption. Sellers enjoying market power in the sale of one or more final products will sometimes find it profitable to assemble these commodities into bundles containing other, competitively supplied complementary market goods for the same reasons that intermediate product monopolists sometimes find it profitable to integrate forward into the manufacture of final products. Commodity bundling, in other words, overcomes distortions in relative prices that, if sold separately, would prompt consumers to select less than optimal combinations of complementary final products employed in home production. The sub-optimal combinations of final products chosen by consumers on ordinary offers are displaced by all-or-none offers of commodity bundles assembled for them that are optimal both from the point of the view of the seller and of the typical buyer.

A key implication of the analysis is that intervention by regulatory or antitrust authorities aimed at requiring sellers to unbundle the packages they offer to consumers threatens reductions in society's welfare. Such welfare losses plainly followed the Federal Trade Commission's promulgation of the Funeral Rule; they also loom in the proposal by nine non-settling states to force Microsoft to create a stripped-down version of the Windows operating system. While not every case of commodity bundling will escape condemnation on the theory advanced herein, the observation that all-or-none offers of packages of complementary final products sometimes serve as substitutes for forward integration into home production supplies an additional reason for exercising caution in enforcing public policies toward business.

Whereas bundling and tie-in sales may be illegal under the Clayton Act, we think we have shown that bundling is an efficient market response that erases some or all of the deadweight losses tied, so to speak, to monopoly.

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<sup>15</sup> This is a complex issue which we cannot address in detail here. Suffice to say that the FCC might be using mandatory unbundling as a carrot to open competition in local telephony where state governments have been slow to act.

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