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ABSTRACT

Companies have been unbundling their products: they have been selling products and services separately that were traditionally sold together. In doing so, they have raised their profits. This paper uses a model to show how companies can use unbundling to increase profits and decrease competition. Unbundling raises problems when it increases information cost, information asymmetry, and barriers to entry. This paper also discusses the U.S. case law that has grasped with these issues of bundling and unbundling.

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I. INTRODUCTION

Bundling refers to the strategy of selling multiple products together as one product in fixed proportions.[1] Legally, bundling is treated as a tying arrangement: "an agreement by a party to sell one product but only on the condition that the buyer also purchases a different (or tied) product, or at least agrees that he will not purchase that product from any other supplier."[2]

In *Jefferson Parish Hospital Dist. No. 2 v. Hyde*, Justice O'Connor wrote a concurring opinion where she provided an easy-to-apply definition for what constitutes an anticompetitive tying arrangement.[3] She stated that three elements must be present: (1) "the seller must have power in the tying product market";[4] (2) "there must be a substantial threat that the tying seller will acquire market power in the tied-product market";[5] (3) "there must be a coherent economic basis for treating the tying and tied products as distinct."[6] Justice O'Connor did not find an anticompetitive tying when a patient sued a hospital claiming that the hospital tied anesthesia and surgical services.[7]

While discussed as a tying arrangement, *Jefferson Parish* was a bundling case. Bundling is tying in fixed proportions.[8] "Bundling is the practice of offering, for a single price, two or more goods or services that could be sold separately. A bundled discount occurs when a firm sells a bundle of goods or services for a lower price than the seller charges for the goods or services purchased individually."[9]

Bundling is a form of *second-degree* price discrimination.[10] The firm offers a menu of offers and lets the consumer self-select their preferred

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[1] William James Adams & Janet L. Yellen, *Commodity Bundling and the Burden of Monopoly*, 90 Q.J. ECON. 475, 475 (1976) ("A firm that sells goods only in package form has adopted a *pure* bundling strategy.").

[2] N. Pac. Ry. Co. v. United States, 356 U.S. 1, 5–6 (1958).

[3] Jefferson Par. Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2, 37–39 (1984) (O'Connor, J., concurring).

[4] *Id.* at 37.

[5] *Id.* at 38.

[6] *Id.* at 39.

[7] *Id.* at 46.

[8] LePage's Inc. v. 3M (Minn. Mining and Mfg. Co.), 324 F.3d 141, 155 (3d Cir. 2003) (stating that bundling discounts "are best compared with tying, whose foreclosure effects are similar").

[9] Cascade Health Sols. v. PeaceHealth, 515 F.3d 883, 894 (9th Cir. 2008).

[10] *See, e.g.*, JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 142–52 (1988).

offer.[11] This selection reveals information about the consumer's type.[12] Firms often struggle to set up such a menu that encourages revealing one's preferences and avoiding arbitrage (i.e. incentive compatible). Second degree price discrimination has welfare ambiguous effects because companies can react in different ways if they are not able to price discriminate.[13]

Justice O'Connor's definition did not show that tying and bundling threatened welfare in every market. Instead, it showed a worry that tying and bundling could be used to leverage one monopoly into another market. Since the *Jefferson Parish* ruling, antitrust bundling cases have focused on the use of bundles to leverage market power into a secondary market to gain market power and exclude others.[14] Absent the ability to monopolize, tying and bundling should be allowed.

Cases like *LePage's Inc. v. 3M*[15] and *Cascade Health Solutions v. PeaceHealth*[16] look at how bundles can be used to exclude competitors. First, the Third Circuit in *LePage's* refused to rule that the bundling rebate was anticompetitive only if the bundle discount meant a below-cost pricing argument.[17] Instead, the Third Circuit advocated a rule of reason where a defendant could introduce procompetitive justifications.[18]

The Ninth Circuit in *Cascade Health* did not endorse the *LePage's* standard.[19] Instead, the court reverted to the predatory below-cost approach adopted by the Supreme Court in *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*[20] The court adopted that "a plaintiff who challenges a package discount as anticompetitive must prove that, when the full amount of the discounts given by the defendant is allocated to the competitive product or products, the resulting price of the competitive product or products is below

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[11] *Id.* at 143.

[12] *See, e.g.*, *id.* at 153. HAL R. VARIAN, INTERMEDIATE MICROECONOMICS 485 (9th ed. 2014).

[13] *See, e.g.*, VARIAN, *supra* note 12, at 485–87.

[14] *See, e.g.*, Nicholas Economides & Ioannis Lianos, *Elusive Antitrust Standard on Bundling in Europe and in the United States in the Aftermath of the Microsoft Cases*, 76 ANTITRUST L.J. 483, 487–95 (2009) (discussing the exclusionary approach for bundles under case law).

[15] *See generally* LePage's Inc. v. 3M (Minn. Mining and Mfg. Co.), 324 F.3d 141, 155 (3d Cir. 2003).

[16] *See generally* Cascade Health Sols. v. PeaceHealth, 515 F.3d 883 (9th Cir. 2008).

[17] *LePage's*, 324 F.3d at 152.

[18] *Id.*

[19] *Cascade Health*, 515 F.3d at 910.

[20] *Id.* at 900–03 (citing Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209, 222 (1993)).

the defendant's incremental cost to produce them."[21] This test is known as the discount attribution test; hence, failing this test makes the bundling *per se* illegal.

Professor Dillbary discussed these and other tests, including the *Ortho Diagnostic System, Inc. v. Abbott Laboratories, Inc.* test[22] and Antitrust Modernization Commission test.[23] Using examples, he showed that these tests are all under- and over-inclusive if the aim of the antitrust laws is to increase societal welfare.[24] He found that bundling can be used to price discriminate and increase company profits but consumers and society at large can benefit as well.[25] He concluded that bundling requires a case-by-case basis analysis and extensive information about costs.[26]

Some companies have resorted to the opposite strategy: *unbundling*. They offer complementary products or services that were once offered together but now are offered separately. This unbundling strategy has been

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[21] *Id.* at 909.

[22] The *Ortho Diagnostic* decision adopted the *Brooke Group* below-cost pricing for bundle discount to show that an injury occurred. Ortho Diagnostic System, Inc. v. Abbott Laboratories, Inc., 920 F. Supp. 455, 465 (S.D.N.Y. 1996). But the court was also worried about the possible foreclosure effect and found that "the fact that [the defendant] has priced each component of its package above average variable cost is not alone sufficient to protect it from Section 2 liability." *Id.* at 469. Thus, the court ruled that a plaintiff must "prove either that (a) the monopolist has priced below its average variable cost or (b) the plaintiff is at least as efficient a producer of the competitive product as the defendant, but that the defendant's pricing makes it unprofitable for the plaintiff to continue to produce." *Id.* at 469. The United States District Court for the Southern District of New York's recommendation is an attribution test with an alternative for showing efficiency harm. The District Court dismissed the case because the plaintiff had failed to show that that "the pricing in the five [products] package is [not] such that incremental net revenue from selling the two additional [products] is greater than the revenue forgone as a result of the price cuts of the original three [products]." *Id.* at 470. Because "it is impossible to determine from the evidence submitted by Ortho whether a rigorous application of [its] compensatory pricing theory would yield the conclusion that Abbott's pricing fell within or without the bounds of Section 2." "Accordingly, the compensatory pricing argument is insufficient to defeat this motion, and Abbott is entitled to summary judgment dismissing all of Ortho's Section 2 claims relating to the pricing of [these products]." *Id.* at 471.

[23] *See generally* J. Shahar Dillbary, *Predatory Bundling and the Exclusionary Standard*, 67 WASH. & LEE L. REV. 1231 (2010); ANTITRUST MODERNIZATION COMMISSION, REPORT AND RECOMMENDATIONS (2007), http://govinfo.library.unt.edu/amc/reportrecommendation/amcfinalreport .pdf. The AMC tri-part test requires the plaintiff to show that: "(1) after allocating all discounts and rebates attributable to the entire bundle of products to the competitive product, the defendant sold the competitive product below its incremental cost for the competitive product; (2) the defendant is likely to recoup these short-term losses; and (3) the bundled discount or rebate program has had or is likely to have an adverse effect on competition." Dillbary, *supra*, at 1246 n.67; *Cascade Health*, 515 F.3d at 900.

[24] *See generally* Dillbary, *supra* note 23, at 1258–78.

[25] *See id.*

[26] *Id.* at 1278–82.

successful because, in many cases, these services are personal and cannot be arbitraged. Examples range far: restaurants charging separately for food and services; airlines separating passenger and luggage transport; furniture companies charging separately for parts and assembly; etc.

Unbundling can take two forms: a mixed bundle or an "add-ons" strategy. Mixed bundle refers to the strategy of offering the same products bundled and unbundled.[27] Add-ons are additional products or services offered after the purchase of the first good or service.[28]

Like bundling, unbundling can raise anti-competitive concerns such as exclusion and price discrimination. Unbundling can also raise consumer protection problems. This Article offers a simple and elegant model to show how unbundling can be harmful.

This Article discusses some harmful effects of unbundling. Section 2 looks at the law and economics of unbundling. Building on the traditional Bertrand model, the model can show that unbundling enables companies to enjoy positive economic profits even when they face perfect competition. Section III looks at how unbundling can be used to harm competition and consumers. Unbundling can be used to increase barriers to entry, which raises anti-competition concerns. Unbundling can also be used to decrease competition through product differentiation and lock-in effects. Unbundling can also harm consumers by decreasing product transparency. Finally, unbundling can be used to address other issues, such as the principal-agent problem, but face unintended consequences. Section IV concludes that two types of unbundling should be considered and treated differently. Based on these differences, unbundling companies should face different presumptions in court.

II. PROFIT MAKING UNBUNDLING

Companies bundle products to increase profits. For example, a company faces two types of consumers and sells two products (see Table 1). Type A consumers value product 1 at x and product 2 at y. Type B consumers value

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[27] "A firm that sells the same goods separately as well as in packages has adopted a *mixed* bundling strategy." Adams & Yellen, *supra* note 1, at 475.

[28] Glenn Ellison, *A Model of Add-on Pricing*, 120 Q.J. ECON. 585, 585 (2005) ("In many businesses it is customary to advertise a base price for a product and to try to sell additional 'add-ons' at high prices at the point of sale. […] . In some cases, add-ons can be thought of as a classic price discrimination strategy: the base good and the base good plus the add-on are two different quality levels.").

product 1 at $y and product 2 at $x. Assume that $0 < x < y$ and marginal costs for each product is 0. If the company charges $x for product 1, both A and B type consumers would be willing to purchase it. If the company charges $y for product 1, only B type consumers are willing to purchase it. Similarly, if the company charges $x for product 2, both A and B type consumers are willing to purchase it. If the company charges $y for product 2, only A type consumers are willing to purchase it. If the company sells each product at $x (or $2x together), both types are willing to purchase both goods. But selling together at $x + y$ also ensures that both types are willing to purchase the bundle. The company would be better off bundling.

Table 1: The revenue upsides of bundling

	Willing to pay of type A consumer	Willing to pay of type B consumer
Product 1	x	y
Product 2	y	x
Bundling Product 1 and 2	$x + y$	$x + y$

In the context of an "add-on," the company could offer the first product purchased—regardless of whether it is product 1 or 2—at $y and, once the consumer purchased the first product, the company could let consumers purchase the second product—the one not previously purchased—at $x. This pricing system is akin to a flexible add-on strategy. Mixed bundling involves a simultaneous or sequential purchasing decision whereas add-ons are a sequential purchasing decision.

Most researchers have looked at bundling focusing on monopolists and on whether monopolists can leverage this market power.[29] Monopolists can deploy this strategy to extract more profits or also to exclude others. Consumers can benefit from this strategy because they can gain access to products they may not have been able to afford without the bundle.

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[29] *See, e.g.*, Dillbary, *supra* note 23, at 1251–53; Barry Nalebuff, *Exclusionary Bundling*, 50 ANTITRUST BULL. 321, 340 (2005); Michael D. Whinston, *Tying Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837, 855 (1990).

Some researchers looked at bundling in a competitive environment. For example, Professor Nalebuff looked at bundling in an oligopolistic environment when an incumbent tries to deter entry of a competitor or when they try to raise profits.[30]

When bundling is found to be anticompetitive, the traditional remedy enjoins the companies from bundling. The model below shows how unbundling could also have welfare harming effects even if deployed in a competitive environment.

A. Model of Unbundling

The unbundling examples discussed in this section look like add-ons: at a restaurant, I do not want service without the food; in court, I do not want a barrister without previously speaking with a solicitor; in airlines, I do not want to travel without my luggage; in a hospital, I do not want a surgery without anesthesia; etc. The model below builds on the traditional Bertrand duopoly model and shows how companies can use unbundling to increase profits and decrease competition.

The basic Bertrand model involves two identical firms $\{i, j\}$ selling *homogenous* products with marginal cost of product c. No other company can enter the market. The companies are competing over price p that they independently set.

Consumers purchase one unit of the good and purchase from whoever offers the cheapest good. In other words, the demand D_i that firm i faces for the good is:

$$D_i(p_i, p_j) = \begin{cases} D(p_i) \text{ if } p_i < p_j \\ \dfrac{1}{2} D(p_i) \text{ if } p_i = p_j \\ 0 \text{ if } p_i > p_j \end{cases}$$

The Nash equilibrium of the classic Bertrand model occurs where the price p is set equal to marginal cost i.e. $p_i = p_j = c$ because at this price no firm can do better by deviating alone. An independent price increase does not increase the firm's profit because the demand drops to zero. If the firm i increases its price above c, all consumers would purchase from j instead. An independent

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[30] Barry Nalebuff, *Bundling as an Entry Barrier*, 119 Q.J. ECON. 159, 161–64 (2004).

price decrease leads to negative revenue per unit. If the firm i decreases its price below c, all consumers would purchase from i but firm i would lose on each unit $(p - c)$. By symmetry, the same reasoning applies to firm j. Any other pricing alternatives lead to one or both of the two firms wanting to deviate.[31] At equilibrium, the two firms split the demand: firm i's demand is $\frac{1}{2}D(p_i)$. Its profit are zero because they price at (marginal) cost.

The Bertrand model leads to the perfectly competitive outcome, even with only two firms. The usual solution to this extreme competition would be for the firms to differentiate their products so that the consumers do not just purchase the cheapest product. Product differentiation would allow the firms to exercise some market power.

Assume now that the product can be divided into an initial product (e.g., airfare for the traveler) and a possible add-on (e.g., checked bag transport). The respective marginal costs of the product and add-on are c_1 and c_2.

Assume that the company faces two types of consumers: (1) sophisticated type; and (2) naïve types.

These consumers consider purchasing one unit of both goods. Sophisticated consumers look at the bundle price (i.e. the price of the initial product and its add-ons together). Naïve consumers only compare the price of the initial product and then they decide to purchase the add-on after being locked in. Naïve consumers can also be seen as optimistic because they do not believe they will need the add-on in the future (e.g., a consumer who believes a carry-on will be sufficient but fails to pack accordingly) or as myopic because they value the present so much they do not consider the future.

The sophisticated consumers always buy from the company who offers the cheapest bundle: the consumer buys from firm i if $p_{1i} + p_{2i} < p_{1j} + p_{2j} \Leftrightarrow \beta_i < \beta_j$, where p_{2i} and p_{2j} are respectively the price of good 2 from firm i and j and β_i and β_j are respectively the price of the bundle from firm i and j such that $\beta = p_1 + p_2$.

The naïve consumers always buy from the company who offers the cheapest initial good: the consumer buys from firm i if $p_{1i} < p_{1j}$ and, after that, they purchase the add-on based on the offered price.

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[31] *See* JEFFREY R. CHURCH & ROGER WARE, INDUSTRIAL ORGANIZATION: A STRATEGIC APPROACH 170, 231–82 (2000), for a discussion of the basic Bertrand model.

The demand for firm i's products $D_i\,(p_{1i}, p_{2i}, p_{1j}, p_{2j})$ are:

$$D_i(p_{1i}, p_{2i}, p_{1j}, p_{2j}) = \begin{cases} D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) + D_S(\beta_i, \beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i < \beta_j \\ D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) + \frac{1}{2}D_S(\beta_i, \beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i = \beta_j \\ D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i > \beta_j \\ \frac{1}{2}D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) + D_S(\beta_i, \beta_j) & \text{if } p_i = p_j \text{ and } \beta_i < \beta_j \\ \frac{1}{2}[D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) + D_S(\beta_i, \beta_j)] & \text{if } p_i = p_j \text{ and } \beta_i = \beta_j \\ \frac{1}{2}D_N(p_{1i}, p_{1j}, \beta_i, \beta_j) & \text{if } p_i = p_j \text{ and } \beta_i > \beta_j \\ D_S(\beta_i, \beta_j) & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i < \beta_j \\ \frac{1}{2}D_S(\beta_i, \beta_j) & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i = \beta_j \\ 0 & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i > \beta_j \end{cases}$$

where $D_N\,(p_{1i}, p_{2i}, \beta_i, \beta_j)$ is the demand for naïve consumers and $D_S\,(\beta_i, \beta_j)$ is the demand for sophisticated consumers.

Contrary to the Bertrand model, this model does not have a pure strategy Nash Equilibrium (see Appendix). Specifically, unlike the Bertrand model, firms pricing at marginal cost (i.e. $\beta_i = \beta_j = c_1 + c_2$ or $p_{1i} = p_{1j} = c_1$ and $p_{2i} = p_{2j} = c_2$) is not a Nash Equilibrium.

If the companies i and j were to price at marginal cost (i.e. $p_{1i} = p_{1j} = c_1$ and $p_{2i} = p_{2j} = c_2$), they would make zero profits. But they could be better off by deviation alone. While increasing the price of good 1 does increase profit, increasing the price of good 2 would increase a firm's profit.

Increasing the price of the original product (p_{1i}) would imply losing the demand from every consumer. If the company wants to retain the demand from the sophisticated consumers, it could decrease the price of the add-on (p_{2i}) to keep the bundle price at the same level ($\beta_i = c_1 + c_2$). Such strategy does not however increase profits. Therefore, increasing the price of the original product does not improve firm i's situation.

Increasing the price of the add-on product (p_{2i}) would imply losing the demand from the sophisticated consumers but the firm would retain half the demand from the naïve consumers. The company now earns positive profits on the high-type naïve consumers because the bundle price ($\beta_i > c_1 + c_2$) exceeds its cost. Therefore, increasing the price of the add-on product improves firm i's situation.

Figure 1 depicts the profit Π_i of firm i as a function of the add-on price if the add-on is a normal good. Firm i makes no earning on the original good still priced at $p_{1i} = c_1$. The firm never prices the add-on below cost because,

at this point, it would be better off not offering it at all (i.e. outside opportunity of zero). As the price of the add-on increases, fewer naïve high-type consumers buy the add-on product but, despite the loss of the inframarginal consumer for the add-on, the firm starts earning positive profits from the consumers who still purchase the good above marginal cost. Eventually, the profit decreases as the price increase leads to more losses from consumers refusing to buy the add-on than additional profits from the consumers still purchasing the add-on. Firm i would prefer to price $p_{2i} = p_{2i}^{max}$ than price at $p_{2i} = c_2$.[32]
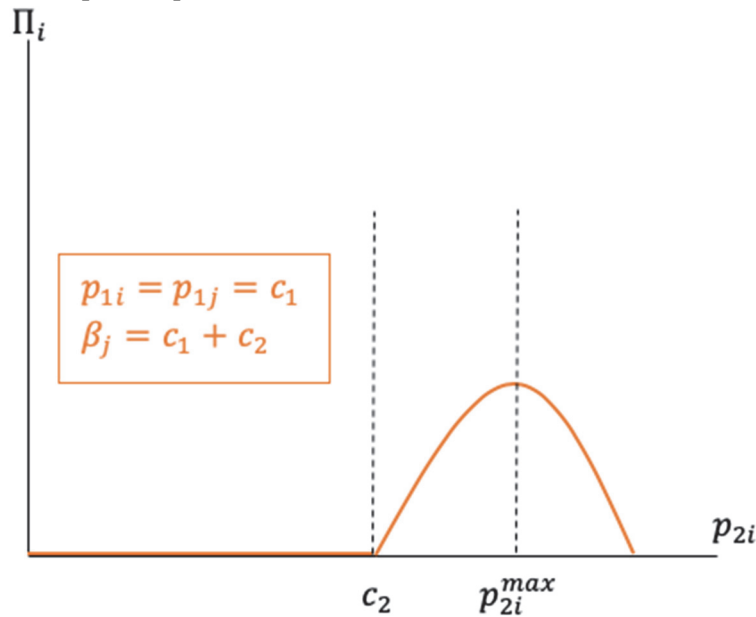
Figure 1: Profit for firm i as a function of the add-on price

However, $p_{1i} = p_{1j} = c_1$, $p_{2j} = c_2$ & $p_{2i} = p_{2i}^{max}$ is not a stable equilibrium. At this price, firm j would be better off increasing the price for good 2, p_{2j}. It will undercut p_{2i}^{max} by the smallest possible margin: firm j would charge p_{2j}^u for the add-on such that $p_{2j}^u = p_{2i}^{max} - \varepsilon$, where ε is the

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[32] This assumes that the demand from high-type naïve is positive for some $p_{2i} > c_2$ then $p_{2i} = p_{2i}^{max}$ where $\frac{\partial D_N(p_{1i}, p_{1j}, \beta_i, \beta_j)}{\partial p_{2i}} = c_2$.

smallest price increment possible. This strategy ensures that firm j retains the whole demand from sophisticated consumers and yet make positive profits from these consumers and the naïve consumers as well.

Again, this strategy is not a stable equilibrium. At this price, firm i would be better off undercutting firm j by the smallest possible margin (such that $p_{2i}^u = p_{2j}^u - \varepsilon = p_{2i}^{max} - 2\varepsilon$) to try to capture the whole demand from sophisticated consumers. This iterative process keeps going until the price for the add-on for either firm reaches a certain point where undercutting becomes not as profitable as charging the maximum price p_{2i}^{max}. This price is showed on as p_{2i}^{min} on Figure 2—the two demands are assumed to be identical but for the naïve type's myopic attribute.
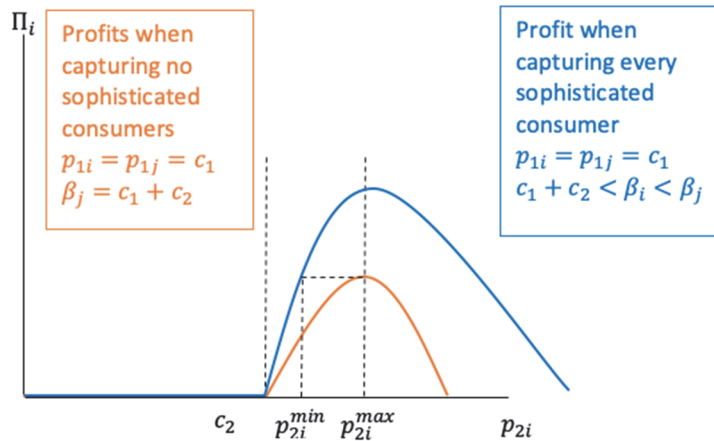
Figure 2: Profit for firm i as a function of the add-on price and when undercutting the competition

The process follows an Edgeworth price cycle, but the price never drops down to the marginal cost. The unbundling ensures that both companies make profits because they can exploit the naïve consumer lock-in effects.

Both firms may try attracting more naïve consumers by decreasing the price of the first good p_1. Eventually, the firms would decrease the price of the first good to zero (i.e., $p_{1i} = p_{1j} = 0$), they both would attract half the naïve consumers and then they would price the bundles β_i and β_j above cost (i.e. $\beta_i \geq c_1 + c_2$ and $\beta_j \geq c_1 + c_2$).

The model could be made more realistic by keeping the two consumer types (i.e., the high types) and adding a third type: a *low type* consumer who only purchases the initial good from the company offering the cheapest initial good. Adding this consumer type ensures that the firms would be incentivized to price the first good above costs ($p_{1i} \geq c_1$ and $p_{1j} \geq c_1$); however, this assumption does not improve its intuitive results (see Appendix).

The ratio of sophisticated to naïve consumers affects the range over which the Edgeworth price cycle occurs. Depending on the width of this range, it may be easier for the companies to implicitly coordinate because they have less room to price the bundle.

If all the consumers are sophisticated, then the model reverts to the classic Bertrand model. The two firms would compete fiercely over price: they would price at marginal cost and produce the socially efficient output.

Unbundling serves the same purpose as a product differentiation. If the companies cannot unbundle, then they compete in the classic Bertrand model and the firms would price at marginal cost. If the companies can unbundle, then competition decreases, firms exercise some market power over the captured naïve consumers, and homogenous goods are differentiated without resorting to actual product differentiation or trademark.

B. Ambiguous Welfare Effect

This model shows how competing companies can use unbundling to profit the same way monopolists have been accused of using bundling to profit. Firms select the optimal strategy for the demand they face. A company bundles or unbundles because (it believes) it can profit from the strategy.

However, firms rely on their ability to prevent arbitrage. In all the cases discussed above, arbitrage is impossible: add-ons can only be consumed by the original purchaser. Most add-ons that follow this model tend to be non-transferable personal services. A restaurant goer cannot transfer services to another consumer if they only want the food. Plaintiff who hired a solicitor cannot sell the work of their barrister to another plaintiff. Travelers who only want airfare cannot (usually) sell their rights to a suitcase. A patient who got anesthesia cannot sell to another patient a hospital's surgery services.

These examples illustrate two types of add-ons: (1) optional add-ons and (2) necessary add-ons. Optional add-ons are complementary products that some consumers purchase while others do not (e.g., luggage and air

travel). Producers of these products face both low type consumers who would purchase only the first good and high type (sophisticated and naïve) consumers who would purchase the bundle. Necessary add-ons are complementary products that all consumers purchase (e.g., anesthesia and surgery). Producers of these products face only high type consumers—whether naïve or sophisticated—because both products in the bundle must be consumed together.

Adopting this strategy also affects consumer and societal welfare. The effect of unbundling on welfare cannot, nonetheless, be generalized.[33] On the one hand, unbundling could benefit consumers and society at large. Unbundling optional add-ons could increase consumer and societal welfare by catering to low type consumers. Unbundling necessary add-ons could have pro-competitive effects if competition exists in both first and add-on product markets. On the other hand, unbundling could harm consumers and society at large. Unbundling optional add-ons could harm naïve consumers because the price they face increases. Unbundling necessary add-ons could have anti-competitive effects and foreclose competition.

The model above shows that unbundling companies increase prices above marginal cost. If priced at marginal cost when the goods were bundled, unbundling increases the price for both the sophisticated and naïve consumers. But a low type consumer who would only want the first good would now be unable to purchase that good at a lower cost. Depending on the mix of low/sophisticated/naïve type consumers, consumer and societal welfare could be negatively affected by unbundling.

Empirical investigations of optional add-ons have supported these observations. Brueckner et al. looked at the effect of unbundling in the airline industry.[34] They built a model and found that unbundling could lead to both a price increase or decrease.[35] Testing empirically, they found that separating the transport of passengers from their luggage through a bag fee led to a decrease in the pricing for *passenger* only (low type).[36] But, the price

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[33] In general, unbundling/bundling ambiguously affects societal welfare. See TIROLE, *supra* note 10, at 149, for a discussion of the welfare of second-degree price discrimination in general.

[34] Jan K. Brueckner et al., *Product Unbundling in the Travel Industry: The Economics of Airline Bag Fees*, 24 J. ECON. & MGMT. STRATEGY 457 (2015).

[35] *Id.* at 461–63.

[36] *Id.* at 481 ("Although measuring the bag fee's effect on the different fare types underlying the average is problematic, the percentile regressions show that the 25th percentile fare falls by about $7.00

decrease did not reflect the full bag fee.[37] In other words, those consumers who valued the service above the cost saving but below the bag fee were harmed by the unbundling of airfare and bag-fee.

If policymakers were worried about bundling or unbundling, having a ban on either would be inefficient.[38] Instead, each case needs to be analyzed separately—even in the monopoly situation.[39] The section below discusses when unbundling becomes harmful.

III. HARMFUL UNBUNDLING

Unbundling optional add-ons may be rational for companies who try to increase profits by pricing to different consumer types. However, it is less rational when companies compete in a product bundled with necessary add-ons. When bundling forecloses competition,[40] unbundling increases competition. Unbundling allows some companies to enter only one market product instead of entering the bundle market. The competition for the first product increases even if the competition in the bundle market does not. The prices of the bundle may even decrease in response to more competition in the product market.

For example, the unbundling of handset and phone contract could have had this effect. Code Division Multiple Access (CDMA) and Global System for Mobiles (GSM) are wireless technologies widely adopted in the 1990s.[41] They were substitute technologies. CDMA had a lock-in feature: consumers

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when a bag fee is adopted, an amount equal to about one-half to one-third of the fee. As a result, it appears that the full-trip price rises for the average leisure passenger by at least half of the bag fee on trips when that passenger checks a bag. Non-bag checkers among leisure passengers, however, benefit from a lower fare.").

[37] *See id.*

[38] "[B]undling helps to average the reservation values of the two consumer types, whereas in the unbundled case, the company is forced to price to the lowest valuation consumers, in order to get them to purchase the good." CHURCH & WARE, *supra* note 31, at 170.

[39] Adams & Yellen, *supra* note 1, discussed and modeled the welfare effect of monopoly pricing, pure bundling, and mixed bundling. They found that monopolists can be better off using any of the three strategies depending on the relationship between willingness to pay and cost of production. They also found that "commodity bundling generally leads to welfare losses when compared with perfect competition. But this does not imply that banning package selling per se decreases the burden of monopoly." *Id.* at 494.

[40] *See, e.g.*, Adams & Yellen, *supra* note 1; Dillbary, *supra* note 23; Whinston, *supra* note 29.

[41] Sascha Segan, *CDMA vs. GSM: What's the Difference?*, PC MAG UK (May 24, 2019, 3:33 PM), https://uk.pcmag.com/news-analysis/11593/cdma-vs-gsm-whats-the-difference.

had to get approval from the network service provider, which tied the mobile phone to the network. GSM allowed a user to switch phones by switching transferable Subscriber Identity Module (SIM) cards.[42] The GSM unbundling technology led to more competition in the mobile phone market and fewer opportunities for lock-ins.

The four sub-sections below discuss why companies may decide to unbundle when it seems to increase competition.

A. Unbundling as a Barrier to Entry

Like bundling, unbundling can be used to foreclose competition. The model above assumed that the product could be unbundled at no cost, i.e. $C_\beta = c_1 + c_2$. In reality, the cost of selling the bundle could be less than the cost of selling two products separately i.e. $C_\beta < c_1 + c_2$. Selling a bundle requires less packaging, storage, and marketing, or simply enables companies to create economics of scope. If unbundling is costly, a market leader could use that strategy to foreclose competition.

A market leader who unbundles may force competitors to unbundle. A competitor may want to make their proposition more comparable to the market leader. To do so, they would follow similar strategy. When unbundling, the competitors need to carry multiple separate products instead of a single product. This broader product line raises the competitor's costs.

This broader product line also segments the market as shown above. This segmentation would not improve competition because any company who wants to enter one segment would have to enter both segments. For example, in the model above, a third entrant who only wants to sell the bundle would never attract the naïve type. Thus, this entrant could miss out on a large section of the market.

Competitors can unbundle to segment a market to create an artificial barrier to entry. Competitors may even agree to unbundle to have two different markets and divide the markets into potential monopolies. These competitors may even use legal means to make their commitment enforceable.

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[42] *Id.*

For example, in the UK, lawyers are divided between barristers and solicitors. The original split has been attributed to economic reasons and class relations.[43] Barristers are litigators while solicitors perform most other functions. This unbundling of legal services was formalized in the law.[44] "The historical split of functions fostered a quasi-contractual agreement between the branches to divide territories, giving each a monopoly over their respective field of trade."[45] This division creates a double marginalization for any client who wishes to hire a barrister after consulting a solicitor.

This unbundling creates redundancies when a case requires the involvement of a solicitor and a barrister. Some scholars and practitioners have seen this unbundling as inefficient and have attempted to fuse the professions (i.e. bundle legal services)—to little avail.[46]

Some entities practice unbundling to harm competitors and prevent them from competing. For example, *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.* was a rare instance where the U.S. Supreme Court found that a refusal to deal violated the Antitrust laws.[47] Aspen Highlands and three other ski resorts were in a joint venture that offered interchangeable bundled tickets to all four resorts. After breaking the joint venture, the other three resorts refused to sell tickets for their resorts to the Highlands resort—including selling tickets at retail price.[48] The three resorts unbundled the tickets and attempted to prevent its competitors from bundling the tickets again.[49] The Supreme Court ruled that, in this rarest of circumstances, a refusal to deal could amount to an antitrust violation.[50]

This case shows how an unbundling from the standpoint of bundled offers can harm competitors. They created a marketing joint venture between their competing products. Once the product is successful, the dominant firm unbundled to prevent competitors from competing on equal footing.

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[43] *See, e.g.*, Judith L. Maute, *Alice's Adventures in Wonderland: Preliminary Reflections on the History of the Split English Legal Profession and the Fusion Debate (1000–1900 AD)*, 71 FORDHAM L. REV. 1357, 1358 (2002).

[44] *See id.* at 1360–61.

[45] *Id.* at 1364.

[46] Judith L. Maute, *Revolutionary Changes to the English Legal Profession or Much Ado About Nothing?*, 17 PROF. L. 1, 7 (2006) (discussing the debate around fusion of the two professions).

[47] Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585 (1985).

[48] *Id.* at 589, 593.

[49] *Id.* at 592.

[50] *Id.* at 611.

Eventually, the dominant companies could have taken over the business of the competitors.

B. Unbundling as a Source of Information Asymmetry

Bundling is treated as a tying arrangement, which can be illegal under a rule of reason if used to attempt to monopolize the tied market. As discussed above, unbundling can raise similar issues; however, unbundling can open the door to other problems that may trigger consumer protection laws.

As discussed in the model, companies can profit from unbundling if naïve consumers are present in the market. Competition is not well suited to dealing with this problem. This issue arose in a patent ambush case. Patent ambush is a practice where a patent holder does not disclose to a standard setting organization that its patent is essential to a specific standard and then contends the patent is infringed by the adopted standard. Many standards were created by a single entity (e.g., Betamax, VHS, CD, etc.), who then would license their patents through a patent pool. But as technology became more complicated, more standards have been set through standard setting organizations that require standard setting participants to declare all standard essential patents.

Without patent pools which bundle patents, patents are licensed by individual patent holders. A patent holder's non-declaration of essentiality creates information asymmetries, but the competition laws can prove ineffective. For example, in *Rambus Inc. v. FTC*, the Federal Trade Commission (FTC) sought to enjoin Rambus from charging non-fair, reasonable, and non-discriminatory royalties to standard adopters based on hidden patents.[51] The DC Circuit Court dismissed the case because the FTC did not prove that the standard would not have been adopted, even if Rambus did not agree to the royalties it collected (i.e., no harm was proven).[52]

Consumer protection problems arise when companies try to turn some sophisticated consumers into naïve consumers by increasing the cost of gathering information. In economic terms, companies create information asymmetries that can be leveraged into higher profits.

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[51] Rambus Inc. v. FTC, 522 F.3d 456, 459 (D.C. Cir. 2008).
[52] *Id.* at 467.

Such profit seeking companies can make discovering the price of the add-on costly. For example, the information may only be available after the purchase or buried into fine print. Ellison modeled the add-on pricing model and found that not advertising the prices of add-ons can be profitable for companies.[53] He found that there is a welfare effect trade-off.[54] In other words, companies can use opacity to their advantage.

This rent-seeking strategy would negatively affect societal welfare. It increases the cost of doing business and inefficiencies because consumers must either spend more to purchase the same products without more benefits or rely on beliefs about the bundling situation based on previous interactions with a seller or its competitors.

Unbundling may allow companies to take advantage of consumers who fail to look at the "updated" fine prints. Some consumer protection authorities have viewed this as fraud—particularly if the add-on cost was added after the consumer purchased the first product. For example, *Autorità Garante della Concorrenza e del Mercato* (AGCM), the Italian Competition Authority, has taken this position in the unbundling of human transportation and carry-on luggage. AGCM fined Ryanair and Wizz Air €3 million and €1 million for following this unbundling strategy. It found that this strategy aims at deceiving consumers about the airline ticket price.[55]

Ryanair claimed that charging for carry-on luggage deterred passengers from bringing anything on board, making the boarding process faster.[56] However, the problem of delayed boarding due to carry-on luggage was created because of the fee on checked luggage, which pushed more consumers to substitute checked luggage for carry-ons.[57]

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[53] Ellison, *supra* note 28, at 590.

[54] *Id.* at 604–05.

[55] Press Release, Autorità Garante della Concorrenza e del Mercato, PS11237-PS11272—Ryanair e Wizz Air, La Nuova Policy Bagagli a Mano Inganna i Consumatori Sul Prezzo del Biglietto (Feb. 21, 2019), http://www.agcm.it/media/comunicati-stampa/2019/2/Ryanair-e-Wizz-Air-la-nuova-policy-bagagli-a-mano-inganna-i-consumatori-sul-prezzo-del-biglietto. For a discussion in English of this press release, *see, e.g.*, *Ryanair, Wizzair Fined in Italy Over Cabin Bag Policy*, France 24 (Feb. 2, 2019), https://www.france24.com/en/20190221-ryanair-wizzair-fined-italy-over-cabin-bag-policy.

[56] L'a Autorrità Garante della Concorrenza del Mercato, Nella Sua Adunanza [Meeting minutes of The Competition and Market Guarantee Authority] (Feb. 20, 2019), https://www.agcm.it/dotcmsdoc/allegati-news/PS11272scorr-sanzomi.pdf.

[57] Empirical studies on the operational implications of baggage fees provide mix evidence about the correlation between luggage fees and delays. Early studies by Mariana Nicolae et al., *Do Bags Fly Free? An Empirical Analysis of the Operational Implications of Airline Baggage Fees*, 63 Mgmt. Sci.

The opportunity for fraud is exacerbated by opacity and further price discrimination. Companies charge different prices based on whether the checked bag is the first or second bag,[58] or whether the bag fee is paid at home, at the airport, or at the gate.[59] These practices are aimed at leveraging consumer preferences and lock-in effects. Once consumers purchase an airline ticket, the airline does not compete with other airlines and can charge more for add-ons.

One court in Spain viewed such practice as an unlawful unbundling. They ruled that unbundling was "abusive as it curtails the rights that the passenger has recognized by [article 97 of the Air Navigation Law], generating an imbalance of benefits between the contracting parties to the detriment of the consumer."[60] The court distinguished checked and unchecked luggage, stating that "'hand luggage or unchecked luggage' is said to be an 'essential element of air transport so companies are obliged to carry it without demanding any type of extra charge on top of the price of the

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3147 (2016) and by Davide Scotti et al., *Baggage Fees, Operational Performance and Customer Satisfaction in the US Air Transport Industry*, 55 J. AIR TRANSP. MGMT. 139 (2016) have found that baggage fees led to a decrease in the number of flight delays. However, Amirhossein A. Yazdi et al., *Airline Baggage Fees and Flight Delays: A Floor Wax and Dessert Topping?*, 104 TRANSP. RSCH. PART E: LOGISTICS & TRANSP. REV. 83 (2017) found that their findings were problematic because Nicolae et al. used departure delays instead of arrival delays and Scotti et al. used aggregate data, which did not allow to control for a number of other source of delays. Instead, Yazdi et al. found that baggage fees led to an increase in flight delays but that these delays have been improving over time. For anecdotal evidence, see Martha C. White, *Airlines to Charge for Second Bag*, N.Y. TIMES (Apr. 22, 2008), https://www.nytimes.com/2008/04/22/business/22bags.html (discussing how the new policy of charging for the second checked bag will "encourage people to lug more stuff onto the plane" as a carry-on).

[58] For example, American Airline charges $30 for the first checked bag, $40 for the second checked bag, $150 for the third checked bag, and $200 for the fourth and beyond checked bag. American Airlines, *Checked Bag Policy* (Dec. 1, 2020), https://www.aa.com/i18n/travel-info/baggage/checked-baggage-policy.jsp. The price change cannot be explained based on cost. For example, if a couple checks in one bag each, they would pay $30 twice or $60; however, if one person in the couple checks both bags under their name, this person pays $30 for the first and $40 for the second bag or $70 total.

[59] For example, Ryanair charges "€/£25 if purchased during the initial flight booking, or €/£40 if added online after booking via the Manage my Booking facility, a Ryanair call centre or airport ticket desk." These different prices are price discrimination where the airline company leverages its greater bargaining power after the booking (i.e., the consumers are locked-in and cannot shop anymore). Ryanair, *Baggage Policy*, https://www.ryanair.com/us/en/plan-trip/flying-with-us/baggage-policy (last visited Nov. 9, 2020).

[60] Alicia Kember, *Madrid Court Orders Ryanair to Pay Back Hand Luggage Charge to Passenger*, EL PAIS (Nov. 21, 2019), https://english.elpais.com/elpais/2019/11/21/inenglish/1574341370_785223.html (the English version of this article was written by Ms. Kember).

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ticket.'"[61] The court viewed passenger travel and their hand luggage as one and the same.

The issue is not necessarily about unbundling, but about opacity. Transparency would create a more competitive market. Some U.S. policymakers proposed policies to discourage excessive pricing and to encourage transparency, which were never implemented.[62] In the end, the bargaining position between consumers and airlines continue to grow because these companies can leverage information asymmetries.

Arguably, the change in fine print can only be exploited for a short period of time—if consumers are rational. A given consumer learns the true cost of a fare through experience. However, the airlines can deploy a mixed strategy that does not let consumers adapt (e.g., Edgeworth cycle); they have market power over certain destinations, and new naïve consumers start shopping for airfares every day.[63] In the meantime, some consumers could be heavily penalized.

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[61] *Id.*

[62] *See, e.g.*, Helaine Olen, *How a Low-level Decision on Baggage Fees Spotlights the Worst of Trump*, WASH. POST (Dec. 12, 2017), https://www.washingtonpost.com/blogs/plum-line/wp/2017/12/12/how-a-low-level-decision-on-baggage-fees-spotlights-the-worst-of-trump/?noredirect=on&utmterm=.c9e1e0bd6885; Jon Delano, *Pa. AG Protests Repeal of Rules Protecting Consumers on Airline Baggage Fees*, CBS PITTSBURGH (Dec. 19, 2017), https://pittsburgh.cbslocal.com/2017/12/19/airline-baggage-fee-rule-pennsylvania-attorney-general/; A.W., *Why the Trump Administration Has Enraged Flyers Across America*, ECONOMIST (Dec. 11, 2017), https://www.economist.com/gulliver/2017/12/11/why-the-trump-administration-has-enraged-flyers-across-america; David Shepardson, *Trump Administration Opposes Requiring 'Reasonable' Airline Baggage Fees*, REUTERS (May 25, 2018), https://www.reuters.com/article/us-usa-airlines-regulation/trump-administration-opposes-requiring-reasonable-airline-baggage-fees-idUSKCN1IQ2XH.

[63] A lawsuit against American Airlines alleged that the airline breached its contractual obligations when charging consumers baggage fees after promising a free first checked bag. The lawsuit was eventually settled. A jury will never be able to rule on these claims. "[W]ithout admitting or conceding any wrongdoing . . . American [Airlines] consents to the Settlement and to certification of a class action for settlement purposes only, solely to avoid the expense, inconvenience and inherent risk of litigation as well as continued disruption of its business operations." *See* Settlement Agreement and Release in Bazerman v. Am. Airlines, No. 1:17-cv-11297-WGY (D. Mass. 2018). In this case, the plaintiff wanted an injunction to stop the airline from charging passenger a bag fee if they were promised otherwise. This injunction could seem overzealous: another alleged victim could raise the case in court again. But an injunction would be more easily enforced than having new costumers bringing another lawsuit. *See also* Karen Kidd, *Judge Approves Harvard Professor's Settlement with American Airlines Over Baggage Fees; Almost $3M to Attorneys*, LEGAL NEWS LINE (July 17, 2018), https://legalnewsline.com/stories/511488061-judge-approves-harvard-professor-s-settlement-with-american-airlines-over-baggage-fees-almost-3m-to-attorneys.

Using competition law could be maladapted to this opacity problem. Courts have been worried that forcing unbundling to protect consumers and changing the consumer's bargaining power would not be sufficient to protect consumer welfare. Companies could still exploit information asymmetries to extract supra-competitive profits. For example, in *United States v. Loew's Inc.*, the U.S. Supreme Court looked at the practice of block-booking, a bundling of different movies together and sold as a package.[64] The Court found that some block-booking arrangements violated the antitrust laws because they negated the ability of theaters to negotiate for individual movie licenses.[65] The Court did not bar bundling but instead required that companies offered the goods separately if it wanted to offer them as a bundle.[66]

The district court worried that unbundling alone would not be sufficient because the products could still be constructively bundled.[67] At the urging of the government, the Supreme Court went even further. It required that the prices for individual goods and their bundle be provided *together* to the consumers. The Court worried that withholding individual pricing would create information asymmetries and uneven bargaining power that the bundler could leverage.[68]

This decision[69] illustrates the risk and unintended consequences of forcing unbundling. Pricing schemes become more complicated every day

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[64] United States v. Loew's Inc., 371 U.S. 38, 40 (1962).

[65] *Id.* at 40–44.

[66] *Id.*

[67] *Id.* at 43 ("(C) Entering into any agreement to sell or license the right to exhibit any feature film over any television station in which the differential between the price or fee for such feature film when sold or licensed alone and the price or fee for the same film when sold or licensed with one or more other film [sic] has the effect of conditioning the sale or license of such film upon the sale or license of one or more other films.").

[68] *Id.* at 53–54 ("This subtler form of sales pressure, though not accompanied by any observable delay over time, might well result in some television stations buying the block rather than trying to talk the seller into negotiating on an individual basis. Requiring the production of the individual list on first approach will obviate this danger.").

[69] Part of *Loew's* and its predecessor *United States v. Paramount Pictures, Inc.*, 334 U.S. 131 (1948) (holding that block booking and vertical integration were anti-competitive) were later partly overturned because the Court assumed market power based on copyright instead of investigating it. In *Illinois Tool Works Inc. v. Independent Ink, Inc.*, the Court "conclude[d] that tying arrangements involving patented products should be evaluated under the standards applied in cases like *Fortner II* and *Jefferson Parish* rather than under the *per se* rule applied in *Morton Salt* and *Loew's*." Ill. Tool Works Inc. v. Indep. Ink, Inc., 547 U.S. 28, 42 (2006).

and companies are leveraging consumers' limited ability to predict their consumption or do the expected calculus. Consumer protection laws may prove a better route than competition laws when dealing with information asymmetries. The next section discusses how unbundling can be used to decrease competition by locking consumers into a differentiated product.

C. Unbundling to Product Differentiate

Unbundling is a form of price discrimination. It allows companies to charge different consumer types different prices. Some forms of price discriminations are unlawful but have been narrowly read.[70] The Robinson-Patman Act[71] amended the Clayton Antitrust Act of 1914[72] and prohibits some price discrimination.[73] In *FTC v. Morton Salt Co.*,[74] the Supreme Court looked at price discrimination and required four elements: (1) different prices for goods[75] (2) of "like grade and quality"[76] (3) which affects competition[77] and (4) interstate commerce.[78] In other words, most forms of price discrimination would not violate antitrust laws.

However, as the model above shows unbundling increases price and indirectly decreases competition through product differentiation and lock-in effects. Companies can use bundling and unbundling to differentiate their products.[79] Product differentiation has two main effects. First, product differentiation makes comparison of product and service more difficult.[80] In turn, because comparison is more difficult, companies gain market power and

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[70] Daniel J. Gifford & Robert T. Kudrle, *The Law and Economics of Price Discrimination in Modern Economies: Time for Reconciliation?*, 43 U.C. DAVIS L. REV. 1235, 1269–72 (2010) (discussing the diminished enforcement of price discrimination in the U.S.).

[71] Robinson-Patman Act, 15 U.S.C. § 13(a)(2).

[72] Clayton Antitrust Act, 15 U.S.C. §§ 12–27; Clayton Antitrust Act, 29 U.S.C. §§ 52–53.

[73] 15 U.S.C. § 13(a)(2).

[74] FTC v. Morton Salt Co., 334 U.S. 37 (1948).

[75] *Id.* at 42–43.

[76] *Id.* at 45.

[77] *Id.* at 45–47.

[78] *Id.* at 49 ("Congress intended to protect a merchant from competitive injury attributable to discriminatory prices on any or all goods sold in interstate commerce . . . .").

[79] *See* Hui-Ling Chung et al., *Bundling Strategy and Product Differentiation*, 108 J. ECON. 207 (2013) (modeling how product differentiation and competition affects the incentive to bundle).

[80] *See, e.g.*, CHURCH & WARE, *supra* note 31, at 258 (looking at the theory of product differentiation); Olen, *supra* note 62 (discussing baggage fee and how "airlines and travel websites don't exactly make it easy for us consumers to do price comparisons").

the ability to charge supra-competitive prices.[81] This indirectly decreases competition by raising cost of comparing products to consumers.

Product differentiation has ambiguous effect on societal welfare. On the one hand, consumers can benefit because they get a product that more closely resembles their needs. On the other hand, since the products or services are not directly comparable, consumers would have to expend resources to decide which product to consume. Since information is costly, consumers gather information only if the marginal benefits outweigh the marginal cost. If the information costs outweigh the gain from having a better suited product, product differentiation negatively affects societal welfare.

For example, some airlines like Southwest Airlines[82] still have a bundling policy while others, such as American Airlines,[83] do not. Southwest used this difference to its advantage to differentiate their services. In its advertisements, Southwest compares its ancillary fee policy to other companies.[84] This difference creates an added step for consumers to compare the two propositions.

Second, product differentiation allows companies to manipulate consumers' perception. Companies can leverage their bundling/unbundling strategies to frame their proposition differently. Many consumers are risk-averse and sensitive to framing.[85] Johnson et al. found that consumers respond more positively to discounts when unbundled as a gain.[86] As such, framing the offering can help manipulate consumer purchasing behavior without benefits to society. Framing bundling and unbundling can help veil a price increase as a discount. Companies use the information costs or the

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[81] CHURCH & WARE, *supra* note 31, at 258–63.

[82] Southwest, *Optional Travel Charges* (2020), https://www.southwest.com/html/customer-service/travel-fees.html.

[83] American Airlines, *Checked Bag Policy* (2020), https://www.aa.com/i18n/travel-info/baggage/checked-baggage-policy.jsp.

[84] Jonathan Chew, *Southwest's New Ad Mocks Other Airlines' Fees*, FORTUNE (Oct. 8, 2015), http://fortune.com/2015/10/08/southwest-ad-fees/.

[85] The field of behavioral economics has documented these issues. *See, e.g.*, Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision under Risk*, 47 ECONOMETRICA 263 (1979); Amos Tversky & Daniel Kahneman, *Rational Choice and the Framing of Decisions*, 59 J. BUS. 251 (1989); Daniel Kahneman, Jack L. Knetsch & Richard H. Thaler, *The Endowment Effect, Loss Aversion, and Status Quo Bias*, 5 J. ECON. PERSP. 193 (1991).

[86] Michael D. Johnson et al., *The Effects of Price Bundling on Consumer Evaluations of Product Offerings*, 16 INT'L J. RES. IN MKTG. 129, 140 (1999).

consumers' naivety to rent-seek. The unbundling strategy further adds to the opacity of the market.

Lock-in occurs when the consumers cannot switch sellers without incurring a switching cost. For example, a passenger cannot send their luggage with a different airline without paying for the flight itself. If consumers can anticipate future needs, then companies are not able to leverage the switching costs. But, in some cases, (myopic) consumers may be unable to predict their future needs or their future expenditure on add-ons.[87] Companies can exploit myopic consumers and their short-sightedness. Companies can increase profit through unbundling to make the true cost of consumption opaquer.[88]

In *Eastman Kodak Co. v. Image Technical Services, Inc.*, the U.S. Supreme Court made a rare acknowledgement that consumers can be myopic but may not be fully rational.[89] This case involved a refusal to deal: Kodak refused to sell its parts to independent service organizations providing repair services.[90] The suit was brought under a tying arrangement theory that Kodak was attempting to monopolize the market for repairs—the tied good market.[91] Kodak argued that it lacked sufficient market power in the tying product market (i.e., the copier).[92]

In this rare occasion, the Court considered the information costs and the impact on consumer behavior. The Supreme Court wrote:

> Given the potentially high cost of information and the possibility that a seller may be able to price discriminate between knowledgeable and unsophisticated consumers, it makes little sense to assume, in the absence of any evidentiary support, that equipment-purchasing decisions are based on an accurate assessment of the total cost of equipment, service, and parts over the lifetime of the machine.[93]

This case was a tying arrangement case. The parts and services were tied together. Because Kodak controlled the parts, they controlled the service. It is a rare occasion when the U.S. Supreme Court deviated from the rational

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[87] Xavier Gabaix & David Laibson, *Shrouded Attributes, Consumer Myopia and Information Suppression in Competitive Markets*, 121 Q.J. ECON. 505, 507 (2006) (modeling add-ons and unbundling and how companies can leverage some consumers' myopia for profit).

[88] *Id.* at 510.

[89] Eastman Kodak Co. v. Image Tech. Servs., 504 U.S. 451, 468, 495 (1992).

[90] *Id.* at 455.

[91] *Id.* at 465.

[92] *Id.* at 466–67.

[93] *Id.* at 475–76.

consumer hypothesis. If consumers were rational (i.e., informed and able to predict future consumption), they would have selected their copier based on the total cost over its lifetime. This total cost would have included the part and service fees (i.e., the add-ons). The Court recognized that not all consumers were sophisticated. It also recognized that companies could leverage information costs to extract supra-competitive profits (including in the form of lock-ins) by tying product and services.

Kodak argues that the tying product is the printer where it had no market power (i.e. the *ex-ante* purchasing decision) whereas the Court viewed the part as the tying product (i.e. the *ex-post* purchasing decision).

This case can also be viewed as an unbundling case. Traditionally, companies had offered warranties for parts and labor. Therefore, consumers would see the price of a good and would know its cost over its lifetime or at least the duration of the warranty (e.g., a two-year warranty). Companies were the least cost risk spreader. However, companies viewed an opportunity for an add-on and additional profits. Many companies now sell warranties separately at the time of purchase.

This case illustrates a situation where a sophisticated consumer could have figured out the total cost of the initial product and its add-ons. However, in some situations, this total cost cannot be estimated. Lock-ins through product differentiation relates to the opacity that companies may try to cultivate to profit.

D. Unbundling to Defeat the Principal-Agent Problem

Unbundling necessary complements have produced unintended and harmful consequences. In the service industry, unbundling was created to address the principal-agent problem but lead to worse problems.

The principal agent problem (or agency problem) refers to incentive misalignment associated with the separation of decision making and benefit receiving.[94] On the one hand, the principal benefits from the agent's action and wants the agent to maximize the principal's well-being. On the other

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[94] *See, e.g.*, Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure,* 3 J. FIN. ECON. 305 (1976).

hand, the agent controls its own actions, and its self-interest may be maximized with actions that do not maximize the principal's well-being.

A principal can address this problem by (1) monitoring the agent,[95] (2) bonding the two interests (e.g., incentive contract, bonuses),[96] or (3) using external market devices.[97] For simplicity and cost, some employers have delegated the monitoring to third parties such as other employees or consumers.[98] These same employers have blended the bonding system and external market devices to reward employees based on their performance and realign the agent's interest with the principal's interest.

For example, the U.S. restaurant industry has unbundled the foods from the service (partially) to defeat the principal-agent problem. Most U.S. restaurants pay their wait staff below minimum wage, and the employees rely on tips for their income.

The unbundling ensures that tipped employees are incentivized to provide a better service than if they received a flat wage regardless of service quality. In this system, the consumer monitors the employee and rewards the employee based on observed service.[99] The argument rests on who is the least cost monitor: the employer (i.e., the principal beneficiary) or the client (i.e., third-party beneficiary).

However, this unbundling and incentive system have been criticized. Tipping may not solve the principal-agent problem as intended. First, a rational consumer should not tip. After all, a consumer has already received

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[95] Eric A. Posner, *Agency Models in Law and Economics* (John M. Olin Program in L. and Econ., Working Paper No. 92, 2000) ("Now, one possibility is to monitor the agent and fire her if she does not do a good enough job.").

[96] *See, e.g.*, Canice Prendergast, *The Provision of Incentives in Firms*, 37 J. ECON. LITERATURE 7, 7 (1999) (reviewing the literature on incentives and stating that incentive mechanisms "include piece rates, options, discretionary bonuses, promotions, profit sharing, efficiency wages, deferred compensation, and so on").

[97] *See generally* Gary J. Miller, *Solutions to principal-agent problems in firms*, HANDBOOK OF NEW INSTITUTIONAL ECON. 349 (2005) (discussing different solutions to the principal-agent problem).

[98] *See, e.g.*, Roland Strausz, *Delegation of Monitoring in a Principal-Agent Relationship,* 64 REV. ECON. STUDIES 337 (1997) (comparing monitoring to third-party monitoring); Hal R. Varian, *Monitoring Agents with Other Agents*, 146 J. INST. & THEORETICAL ECON. 153 (1990) (building a model of agent monitoring using the example of the Grameen Bank); Marc Knez & Duncan Simester, *Firm-Wide Incentives and Mutual Monitoring at Continental Airlines*, 19 J. LAB. ECON. 743 (2001) (discussing how financial bonus can incentivize employees to cross-monitor).

[99] *See generally* Ofer H. Azar, *Incentives and Service Quality in the Restaurant Industry: The Tipping-Service Puzzle*, 41 APPLIED ECON. 1917 (2009).

the service and has discretion on the payment. Repeated interaction and reputation may explain some tipping behavior; but the rational consumer should deviate and cheat the waiter out of its true willingness-to-pay for service.[100]

Tipping still constantly occurs in single occurrence interactions. Tipping may reflect more the consumers' feelings than the quality of the service received. "[N]ot tipping might result in psychological disutility due to negative feelings such as embarrassment, unfairness, guilt, and dishonesty."[101] Even bad services may be rewarded.[102] Consumers tip mainly to show gratitude or conform to social norms.[103]

Second, the unbundling of service and food created a bonus system that some consumers have abused. The waitstaff's reliance on tipping for their livelihood has empowered some consumers to misbehave. Waitstaff may not flag consumers' bad behavior for fear of not receiving any compensation or being let go.[104]

Finally, another unintended consequence of unbundling service and food is tax evasion.[105] Waiters are supposed to report their tips as earnings, but waiters constantly underreport based on the restaurant market size.[106] Some U.S. policymakers are investigating whether to increase the minimum wage for tipped workers, which could lead to the re-bundling of food and service.[107]

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[100] Ofer H. Azar, *Business Strategy and the Social Norm of Tipping*, 32 J. ECON. PSYCH. 515, 516 (2011).

[101] Ofer H. Azar, *Strategic Behavior and Social Norms in Tipped Service Industries*, 8 B.E. J. ECON. ANALYSIS & POL'Y 1 (2008) (building a tipping model that includes a disutility from diverging from the social norm).

[102] Hugh Morris, *America's Tipping Culture is Out of Control—Why Should Visitors be Forced to Reward Bad Service?*, TELEGRAPH (June 15, 2018), https://www.telegraph.co.uk/travel/comment/tipping-in-american-out-of-hand/.

[103] *See, e.g.*, Ofer H. Azar, *Tipping Motivations and Behavior in the U.S. and Israel*, 40 J. APPLIED SOC. PSYCH. 421 (2010) (surveying the reasons for tipping); H. Wesley Perkins & Alan D. Berkowitz, *Perceiving the Community Norms of Alcohol Use Among Students: Some Research Implications for Campus Alcohol Education Programming*, 21 INT'L J. ADDICTIONS 961 (1986) (discussing the influence of perceived alcohol consumption on one's own alcohol consumption).

[104] Patrick McGeehan, *Amy Schumer, Amy Poehler and Other Stars Stand Up for Waitresses. The Response: No, Thanks*, N.Y. TIMES (Mar. 22, 2019), https://www.nytimes.com/2019/03/22/nyregion/amy-schumer-poehler-waitresses-wages.html.

[105] *See* Azar, *supra* note 99, at 1917.

[106] *See id.*

[107] *See* Azar, *supra* note 100, at 518.

In other words, the unbundling may not have solved the principal-agent problems. Its unintended consequences may well have worse effect on society than the principal-agent problem itself. The next section discusses how we can address some of the issues related to unbundling.

IV. RECOMMENDATION FOR ADDRESSING HARMFUL BUNDLING

From *Aspen Skiing* to *Eastman Kodak Co.*, the cases cited above have been more the exception than the rule. The U.S. Supreme Court has viewed most consumers as sophisticated and if not, then the sophisticated consumers protect the naïve consumers within the market. Unbundling has not come up often as an issue for the Court; nonetheless, the competition laws are maladapted at dealing with unbundling.

Unbundling from a previous position of bundling may have limited applications. The endowment effect should make moving from bundled to unbundled products more difficult.[108] Unbundling can be seen as a loss and enrage some consumers. For example, a consumer sued an airline when her baggage was lost after she was charged an unbundled baggage fee from her airfare.[109] The consumer paid $25 and requested $5 million in damages.[110] The consumer claims that the suit was about "an entire industry that has lost touch with its customers."[111] More and more consumers see unbundling as a "nuisance fee": this unbundling is not an opportunity for cheaper services because the fee is not related to the service cost.[112]

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[108] *See* Daniel Kahneman et al., *Experimental Tests of the Endowment Effect and the Coase Theorem*, 98 J. POL. ECON. 1325 (1990) (discussing an experiment that test the difference between consumers' willingness to pay and to accept and how this willingness depends on whether the consumers is in possession of the object).

[109] Covarrubias v. Am. Airlines Inc., 2011 WL 13100749, Case No. C10-1158JLR (W.D. Wash. 2011).

[110] Ray Sanchez, *American Airlines Sued for $5M After Refusing $25 Lost Bag Refund*, ABC NEWS (July 22, 2010), https://abcnews.go.com/Business/Travel/american-airlines-sued-million-refusing-25-baggage-fee/story?id=11215965.

[111] Scott Mayerowitz & Ray Sanchez, *American Airlines Disputes $5 Million Lost Bag Lawsuit*, ABC NEWS (July 27, 2010), https://abcnews.go.com/Travel/american-airlines-disputes-million-checked-bag-fee-lawsuit/story?id=11253935.

[112] Ron Lieber, *5 Ways to Think About Nuisance Fees*, N.Y. TIMES (Nov. 18, 2011), https://www.nytimes.com/2011/11/19/your-money/5-new-ways-to-think-about-companies-nuisance-fees.html?mtrref=undefined (discussing four reasons why consumers are dissatisfied with fees unbundling: (1) fee to cost correlation; (2) service provider disapproval; (3) fee justification; (4) value for money).

However, consumers have short memories. They may forget that these goods or services were once bundled. They may assume that the unbundling is natural. Anecdotally, U.S. visitors to non-tipping countries have had a difficulty adapting as much as Europeans visiting the U.S. struggled to adapt to the tipping culture. Soon, all consumers adapt as long as the information is readily available. Customers can run afoul of economic reasoning as shown by the prevalence of the tipping culture.

Instead, antitrust, and consumer protection, authorities should take a closer look at unbundling. Judges should create different presumptions based on the type of unbundling they face. In *Jefferson Parish Hospital Dist. No. 2 v. Hyde*,[113] Justice O'Connor wrote about "a coherent economic basis for treating the tying and tied products as distinct."[114] Add-ons should be viewed differently on whether there is a coherent economic basis for treating them as distinct: (1) optional add-ons would be distinct products whereas (2) necessary add-ons would be the same product.

On the one hand, unbundling optional add-ons can make economic sense. It allows for price discrimination and product differentiation. Both price discrimination and product differentiation can attract consumers that may not have otherwise bought the product.[115] So, unbundling optional add-ons can increase societal welfare—depending on the distribution of consumer types. However, unbundling optional add-ons could be used to increase competitors' costs and foreclose markets. So, unbundling optional add-ons can also decrease societal welfare.

On the other hand, unbundling necessary add-ons make no economic sense. The unbundling company faces more competition if the add-on can be obtained separately without gaining any benefits that would not raise anticompetitive (or consumer protection) issues. Companies' ability to harm consumers depends on their ability to increase information costs, make the market opaquer, and prevent others from entering the market. As such, when a company unbundles necessary add-ons, it reveals that it likely profits either through leveraging information costs or through increasing competitor costs.

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[113] *See* Jefferson Par. Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2 (1984).

[114] *Id.* at 39.

[115] Jonathan B. Baker, *Product Differentiation Through Space and Time: Some Antitrust Policy Issues*, 42 ANTITRUST BULL. 177 (1997) (discussing the limited approach of Antitrust to product differentiation focusing on the effect that product differentiation can have on mergers and investment).

A complainant about unbundling should argue whether an add-on is necessary or optional. This is a question of fact that judges or juries could decide on a case-by-case basis.[116] If the finder of fact decides that an add-on is necessary, then the burden of proof switches to the defendant. Unbundling should be presumed to be anticompetitive or in violation of consumer protection laws. The unbundling company should have a right to present evidence to defeat the presumption. For example, a company could show that they are unbundling to benefit consumers by offering them different versions of the necessary add-ons. The reason should either be pro-competition or pro-consumer.

If the finder of fact decides that an add-on is optional, then the plaintiff carries the burden of proof to show that the unbundling was anticompetitive by creating artificial barriers to entry. Unbundling optional add-ons has ambiguous welfare effects. Thus, making unbundling of optional add-ons *per se* illegal could harm society. Instead, each case needs to be investigated individually under a rule of reason to see whether unbundling optional add-ons increased barriers to entry and decreased competition.

The Supreme Court may not wish to patronize consumers and discourage their information gathering efforts. However, it should disincentivize companies from increasing information costs for consumers and from deterring entry. A switched burden of proof depending on the type of add-on could reach that aim.

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[116] The application of a rule of reason or a quick rule would depend on whether the product is considered an optional or necessary add-on respectively. Judges and juries can apply both rules once they decide the type of add-on they are facing. For a discussion of both rules and the associated presumption see Garry A. Gabison, *Juries Can Quick Look Too*, 10 SETON HALL CIR. REV. 271 (2014).

APPENDIX

Assume that the company faces three types of consumers: (1) low type; (2) sophisticated high type; and (3) naïve high types.

Low type consumers only purchase the initial good. These consumers always buy from the company offering the cheapest initial good: the consumer buys from firm i if $p_{1i} < p_{1j}$, where p_{1i} is the price of good 1 from firm i and p_{1j} is the price of good 1 from firm j.

High type consumers consider purchasing one unit of both goods. Sophisticated consumers look at the bundle price (i.e., the price of the initial product and its add-ons together). Naïve consumers only compare the price of the initial product and then they decide to purchase the add-on after being locked in.

The presence of low type consumers makes the pricing below cost of the first good less likely, but it does not change the reasoning. Without loss of generality, the three type of consumers are assumed to be present in society on an equal ratio.

The demand for firm i's products $D_i\,(p_{1i}, p_{2i}, p_{1j}, p_{2j})$ is:

$$D_i(p_{1i},p_{2i},p_{1j},p_{2j}) = \begin{cases} D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j) + D_S(\beta_i,\beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i < \beta_j \\[4pt] D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j) + \frac{1}{2}D_S(\beta_i,\beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i = \beta_j \\[4pt] D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j) & \text{if } p_{1i} < p_{1j} \text{ and } \beta_i > \beta_j \\[4pt] \frac{1}{2}\left[D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j)\right] + D_S(\beta_i,\beta_j) & \text{if } p_{1i} = p_{1j} \text{ and } \beta_i < \beta_j \\[4pt] \frac{1}{2}\left[D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j) + D_S(\beta_i,\beta_j)\right] & \text{if } p_{1i} = p_{1j} \text{ and } \beta_i = \beta_j \\[4pt] \frac{1}{2}\left[D_O(p_{1i},p_{1j}) + D_N(p_{1i},p_{1j},\beta_i,\beta_j)\right] & \text{if } p_{1i} = p_{1j} \text{ and } \beta_i > \beta_j \\[4pt] D_S(\beta_i,\beta_j) & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i < \beta_j \\[4pt] \frac{1}{2}D_S(\beta_i,\beta_j) & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i = \beta_j \\[4pt] 0 & \text{if } p_{1i} > p_{1j} \text{ and } \beta_i > \beta_j \end{cases}$$

The cases below show that this game does not have a pure strategy Nash equilibrium.

- Case 1: if $p_{1i} > p_{1j} > c_1$, then the low type and the naïve high type consumers prefer to purchase from firm j. All of firm i's demand $D_i\,(p_{1i}, p_{2i}, p_{1j}, p_{2j})$ depends on the quantity demanded by sophisticated high type consumers.

- ○ Case 1.1: if $\beta_i > \beta_j > c_1 + c_2$, all the consumers prefer to purchase from firm j. Firm j has some positive profits while firm i makes zero profit. So, firm i would be better off decreasing its prices for either good 1 p_{1i} or the bundle β_i below firm j's prices to try to capture some demand and make some positive profits.
  - ○ Case 1.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j. Firm i makes zero profit. Firm i would be better off undercutting firm j on good 1 to capture some of the low type and the naïve high type consumers. Simultaneously, firm j would be better off increasing its prices for either good 1 p_{1i} or the bundle β_i.
  - ○ Case 1.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Both firms would be better off undercutting the current bundle price to capture the whole sophisticated high type demand. Firm i would also be better off undercutting the price for the first good p_{1j} to capture the low type and the naïve high type demand.
  - ○ Case 1.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Firm i would be better off decreasing the price for good 1 while keeping the bundle price unchanged. Firm i would be able to capture some of the low type and the naïve high type demand. Firm j would also be better off increasing the price of good 1.
  - ○ Other cases ($\beta_j > \beta_i > c_1 + c_2$ and $\beta_j > \beta_i = c_1 + c_2$) are not discussed because they are symmetric to previous cases (respectively 1.1 and 1.2).
- Case 2: if $p_{1i} > p_{1j} = c_1$, then the low type and the naïve high type consumers prefer to purchase from firm j. All of firm i's demand D_i (p_{1i}, p_{2i}, p_{1j}, p_{2j}) depends on the quantity demanded by sophisticated high type consumers.
  - ○ Case 2.1: if $\beta_i > \beta_j > c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j. Both firms could be better off by charging different prices.
    - ■ Firm i makes zero profit. It can increase its profit by undercutting β_j. It would capture the whole sophisticated high type consumer demand.

- ■ Firm j would also be better off increasing its prices for either good 1 p_{1j} or the bundle β_j. It would retain the whole consumer demand and make more profits.
  - ○ Case 2.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j. Firm i cannot do better by deviating alone but firm j can. Firm j makes zero profit and would be better off increasing its prices for either good 1 or the bundle or both.
  - ○ Case 2.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Both firms could be better off undercutting the current bundle price to attract the whole sophisticated high type demand. Firm j would be better of increasing the price of good 1 while keeping the bundle price constant. Depending on the relative number of sophisticated to naïve high types, firm j could be better off increasing the price good 2: it loses the (half) demand from sophisticated consumers but makes more profits from the naïve consumers.
  - ○ Case 2.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. At these prices, firm j has an incentive to deviate because it can increase its profits by increasing the price for the good 1. Firm j loses the sophisticated high type consumers but it would increase its profit on the low type and the naïve high type demand. Firm j could also increase the price of good 2. It loses the sophisticated high type consumers, but it increases its profit from naïve high type consumers.
    - ■ Note that depending on the relative number of low to high types, firm i could be better with a lost leader on good 1 and profits on good 2. Loss leader is discussed in more details in case 4 & 5.
  - ○ Other cases ($\beta_j > \beta_i > c_1 + c_2$ and $\beta_j > \beta_i = c_1 + c_2$) are not discussed because they are symmetric to previous cases (respectively 2.1 and 2.2).
- Case 3: if $p_{1i} = p_{1j} > c_1$, then the low type and the naïve high type consumers split between the two firms. Sophisticated high type consumers compare the bundle prices.
  - ○ Case 3.1: if $\beta_i > \beta_j > c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j. Firm i makes some

profits but it could increase its profit by decreasing its prices for good 1.

- ○ Case 3.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j but the firm makes no profit from these consumers. Both firms could be better off deviating alone: both could increase its profit by undercutting the competition for good 1. Firm j would also be better off increasing its prices for the bundle through increasing the price for good 2 while decreasing the price of good 1.
- ○ Case 3.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the demand. Both firms could be better off undercutting the current price for good 1 or undercutting the current bundle price to attract the whole sophisticated high type demand or both. If either were to undercut the price for good 1, they could achieve both it could increase its profits.
- ○ Case 3.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand but make zero economic profit from these consumers. At these prices, either firm increases its profits by decreasing the price of good 1 p_1 marginally to try to capture the whole demand from the low type and the naïve high type consumers. However, such a firm would also need to increase the price of good 2 to ensure the firm does not lose money on the sophisticated high types.
- ○ Other cases ($\beta_j > \beta_i > c_1 + c_2$ and $\beta_j > \beta_i = c_1 + c_2$) are not discussed because they are symmetric to previous cases (respectively 3.1 and 3.2).
- Case 4: if $p_{1i} \geq c_1 > p_{1j}$, then the low type and the naïve high type consumers purchase from firm j. In such a situation, firm j decides to use the first good as a lost leader. All of firm i's demand D_i (p_{1i}, p_{2i}, p_{1j}, p_{2j}) depends on the quantity demanded by sophisticated high type consumers, N.
  - ○ Case 4.1: if $\beta_i > \beta_j > c_1 + c_2$, all the consumers prefer to purchase from firm j. Firm i makes zero profit whereas firm j could be positive or negative profits depending on the consumer type distribution. Firm i would be better off decreasing its prices for the bundle β_i until $\beta_j > \beta_i > c_1 + c_2$ to try to capture some demand from sophisticated high type consumers.

- ○ Case 4.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j and firm j has negative profits: it makes no profit on the high types and loses money on the low types. Firm j would be better exiting the market or charging $p_{1j} = c_1$ and $\beta_j = c_1 + c_2$ where it would make zero profits.
- ○ Case 4.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Firm i makes positive profits whereas firm j's profit could be positive, negative or zero. Firm j makes some profits on the high types but loses money on the low types. Firm i would be better off undercutting the current bundle price to attract all the sophisticated high type consumers. Firm j could be better off undercutting the bundle price as well but it is less clear. Decreasing the bundle price affects both the marginal profits from sophisticated and naïve high type consumers. If sophisticated high types sufficiently outnumber naïve high types, firm j could be better off undercutting firm i on the bundle.
- ○ Case 4.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Firm j is earning negative profits because it loses money on the low type and makes no money on the high type. Firm j would be better exiting the market or charging $p_{1j} = c_1$ and $\beta_j = c_1 + c_2$ where it would make zero profits.
- ○ Case 4.5: if $\beta_j > \beta_i > c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i. Firm i makes some profits but would be better off increasing its prices for the bundle β_i. Firm j makes some profits on the naïve high types but loses money on the low types. Firm j would be better off increasing the price for product 1.
- ○ Case 4.6: if $\beta_j > \beta_i = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i but firm i makes no profit. It would be better off increasing the bundle price β_i. Firm j makes some profits on the naïve high types but loses money on the low types. Firm j would be better off increasing the price for product 1.
- • Case 5: if $c_1 > p_{1i} > p_{1j}$, then the low type and the naïve high type consumers purchase from firm j. In such a situation, firm j decides

to use the first good as a lost leader. All of firm i's demand D_i (p_{1i}, p_{2i}, p_{1j}, p_{2j}) depends on the quantity demanded by sophisticated high type consumers.

- Case 5.1: if $\beta_i > \beta_j > c_1 + c_2$, all the consumers prefer to purchase from firm j. Firm i makes zero profit whereas firm j could be positive or negative profits depending on the consumer type distribution. So, firm i would be better off decreasing its price for the bundle to try to capture some demand. Firm i would make some positive profits.

- Case 5.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j and firm j has negative profits: it makes no profit on the high types and loses money on the low types. Firm j would be better exiting the market or charging both goods at cost where it would make zero profits.

- Case 5.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Firm i makes positive profits whereas firm j's profit could be positive, negative or zero. Firm j makes some profits on the high types but loses money on the low types. Firm i would be better off undercutting the current bundle price to attract all the sophisticated high type consumers. Firm j could be better off undercutting as well depending on the distribution of high types.

- Case 5.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. Firm j is earning negative profits because it loses money on the low type and makes no money on the high type. Firm j would be better exiting the market or charging at cost.

- Case 5.5: if $\beta_j > \beta_i > c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i. Firm i makes some profits but would be better off increasing its prices for the bundle β_i. Firm j makes some profits on the naïve high types but loses money on the low types. Firm j would be better off increasing the price for product 1.

- Case 5.6: if $\beta_j > \beta_i = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i but firm i makes no profit. It would be better off increasing the bundle price β_i. Firm j makes some profits on the naïve high types but loses

money on the low types. Firm j would be better off increasing the price for product 1.

- Case 6: if $p_{1i} = p_{1j} = c_1$, then the firms split the demand from the low type and the naïve high type consumers. The firms make no profit from the low type. Their profits depend on the high types.
  - Case 6.1: if $\beta_i > \beta_j > c_1 + c_2$, all the consumers prefer to purchase from firm j. Firm i makes zero profit whereas firm j makes positive profits. Firm j would prefer increasing the price of the bundle to capture more profit. Depending on the distribution of naïve to sophisticated high types, firm i could be better off decreasing its prices for the bundle to capture some sophisticated high demand.
  - Case 6.2: if $\beta_i > \beta_j = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm j and firm j makes no profits. Firm j would be better increasing the bundle price.
  - Case 6.3: if $\beta_i = \beta_j > c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. They both make positive profits. They both would be better off undercutting the current bundle price to attract all the sophisticated high type consumers.
  - Case 6.4: if $\beta_i = \beta_j = c_1 + c_2$, firms i and j split the sophisticated high type consumer demand. They both make no profits. Either firm would be better off increasing the price of good 2. Such a strategy leads to the firm making zero profit on the low type consumers that selects select their product and some positive profits on the naïve high type consumers while the sophisticated high type consumers would buy from the other firm.
  - Case 6.5: if $\beta_j > \beta_i > c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i. Firm i makes some profits but would be better off increasing its prices for the bundle. Firm j makes some profits on the naïve high types. Firm j would be better off increasing the price for product 2.
  - Case 6.6: if $\beta_j > \beta_i = c_1 + c_2$, the sophisticated high type consumers prefer to purchase from firm i but firm i makes no profit. It would be better off increasing the price of good 2. Firm j makes some profits on the naïve high types but it would be better of increasing the price for product 2.