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Bundling, product choice, and efficiency: Should cable television networks be offered à la carte?

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Abstract

We conduct a numerical analysis of bundling's impact on a monopolist's pricing and product choices and assess the implications for consumer welfare in cable television markets. Existing theory is ambiguous: for a given set of products, bundling likely transfers surplus from consumers to firms but also encourages products to be offered that might not be under à la carte pricing. Simulation of "Full À La Carte" for an economic environment calibrated to an average cable television system suggests that consumers would likely benefit from à la carte sales. If all networks continued to be offered, the average household's surplus is predicted to increase by $6.80 (65.6%) under à la carte sales (despite a total bundle price that almost doubles) and reduced network profits would have to be such that 41 of 50 offered cable networks have to exit the market to make her indifferent. Simulation of a "Theme Tier" scenario provides intermediate benefits. The incremental marginal costs to cable systems of à la carte sales and its impact in the advertising market and on competition are important factors in determining consumer benefits.

JEL classification: L12; L82; L50

Keywords: Bundling; Product choice; Cable television; à la carte; Policy analysis

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1. Introduction

Bundling is a common feature in many imperfectly competitive product markets. Firms in the telecommunications, financial services, health care, and information industries frequently offer products in bundles. While often innocuous, recent research has identified settings in which bundling can be used by firms to price discriminate among consumers or to extend market power into related product markets (Adams and Yellen, 1976; Bakos and Brynjolfsson, 1999; Nalebuff, 2004).

We conduct a numerical analysis of bundling's impact on the prices and networks offered by a "typical" US cable television system and assess the consequences of these choices for consumer, producer, and total welfare. We do so to speak to the current public policy debate about bundling in cable markets. Motivated by consumer dis-satisfaction over ever-increasing cable prices, law- and policy-makers are looking at unbundling – or "à la carte" pricing – as a possible policy solution.[1] Most cable television systems and the networks provided on them are strongly opposed to the idea, in part claiming that doing so would (possibly dramatically) reduce the number of (especially smaller) networks that can survive in an à la carte environment (Booz Allen Hamilton, 2004).[2]

Existing theory bears out both of these views. On bundling and pricing, a substantial theoretical literature suggests that bundling may be used to sort consumers in a manner similar to second-degree price discrimination (Stigler, 1968; Adams and Yellen, 1976; McAfee et al., 1989; Bakos and Brynjolfsson, 1999; Armstrong, 1999). When consumers have heterogeneous tastes for several products, bundling reduces that heterogeneity, allowing the firm to earn greater profit than would be possible with component (unbundled) prices. While firms clearly benefit in this case, consumer welfare generally falls, particularly when bundling requires consumers to purchase products in which they have little interest.

Less well established are the implications of bundling on the products offered by firms. It is well known that a single-product monopolist will not offer some products that increase social welfare because of the non-appropriability of total surplus (e.g. Tirole, 1988, Chapter 2). A key factor in the extent of the distortion is the shape of consumer preferences; all else equal, products with more elastic demand are more likely to be offered as the monopolist can better appropriate surplus for such goods. In the multi-product case, theory is ambiguous: under-provision due to non-appropriability is still a problem, but if products are substitutes, monopoly pricing on one good may increase demand for a second enough to encourage its (inefficient) offering. In this (multi-product) case, bundling can also influence the calculus of product choice. Because bundling aggregates preferences for bundle components, it makes tastes more homogenous, increasing the elasticity of demand (Bakos and Brynjolfsson, 1999; Crawford, 2006). If marginal costs for bundle components are zero, Bakos and Brynjolfsson (1999) show that as bundle size increases without bound, the product choice problem is solved; bundle profit converges to total surplus and both the monopolist and social planner will offer the same portfolio of goods.

[1] In addition to numerous articles in the popular press (e.g. Reuters, 2003; Squeo and Flint, 2004; Shatz, 2006), the Federal Communications Commission (FCC) has published two reports analyzing à la carte pricing (FCC, 2004, 2006).

[2] The National Cable and Telecommunications Association (NCTA) has a useful webpage summarizing industry perspectives at http://www.ncta.com/IssueBrief.aspx?contentId=15.

When marginal costs are not zero, however, bundling can work *too* well. Because bundling requires all consumers purchase all goods, some sales may arise to consumers that value components at less then their cost. This is particularly problematic when there is strong negative correlation in tastes. Bundling is especially profitable in such settings (Adams and Yellen, 1976; Schmalensee, 1984) and the profit gains from correlation may outweigh the profit losses from below-cost sales. If so, the bundling monopolist may offer products that actually *reduce* total welfare. Even if not, consumer welfare may be lower from bundling; while some consumers will benefit from a new product, these gains may be outweighed by losses to existing consumers of the bundle.[3]

What are the implications of these results for the à la carte debate in cable markets? The first branch of the literature strongly suggests that, *for a given set of networks*, bundling reduces consumer welfare to the benefit of firms. The second branch, however, suggests that by providing stronger incentives to offer new products, bundling may increase consumer (and total) welfare. The natural solution is to attempt to address this question empirically, a topic of related work in progress (Crawford and Yurukoglu, 2007). In this paper, we take a numerical approach. We make assumptions about households' willingness-to-pay (WTP) and firms' costs for television networks. We then calibrate these assumptions to replicate the offerings of an "average" 2004 cable system (California Cable of Monterey, CA) and simulate the profit and welfare consequences of alternative à la carte policy proposals. We do not consider the impact of à la carte on competition and the advertising market (two important caveats), but we do consider the consequence of increased marginal costs to cable systems of à la carte offerings.

Several interesting results emerge from our numerical simulations. We consider two à la carte scenarios: "Full À La Carte" and "Theme Tiers". As expected, if all networks continue to be offered, consumers gain and firms lose from Full À La Carte: average per-household consumers surplus is estimated to increase by \$6.80 (a 65.6% increase), gross firm profit is estimated to fall by \$9.08 (a 44.2% decrease), and gross total surplus is estimated to fall by \$2.28 (a 7.4% decrease). These impacts almost surely outweigh any compensating benefit of à la carte to enhance incentives to offer networks: we estimate that 41 of the 50 offered cable networks in Monterey would have to exit for consumers surplus under Full À La Carte to be no higher than that under bundling. Theme tiers offer similar, though smaller, effects (a 14.2% increase in consumers surplus, a 15.7% decrease in profit, a 5.7% decrease in total surplus, and 24 networks needed to exit to equate consumer benefits). These results suggest consumers might well benefit from à la carte sales of cable networks.

[3] In addition to the general literature cited here, there is a sizable literature analyzing the programs offered by firms in media (esp. radio and television) markets. Dating to Steiner (1954), this literature has focused on the consequences of competition (versus monopoly) and advertiser (versus pay) support on the number and type of programs offered by firms and their consequence to consumer, advertiser, and total welfare (cf. Owen and Wildman, 1992; Doyle, 1998; Berry and Waldfogel, 1999; Anderson and Coate, 2005). The contribution of this paper is to focus on the case most relevant to cable television – pay-supported multi-product monopoly – and analyze the impact of bundling on firms' choices. Extending the analysis here to consider the impact of competition with satellite systems and the advertising market would be valuable contributions. We discuss the likely consequences of these omissions in Section 3.

2. The welfare effects of bundling

In this section we illustrate the welfare effects of bundling by a multi-product monopolist. In the first subsection, we illustrate the discriminatory effects of bundling for a given set of products. In the second, we extend this result to consider the impact of bundling on the set of offered products.

2.1. The discriminatory effects of bundling

2.1.1. The case of two goods

Most of the discriminatory bundling literature has focused on the incentives to bundle two goods. Adams and Yellen (1976) formalize the seminal work of Stigler (1963) and present examples where bundling is more or less profitable than component (unbundled) sales. Schmalensee (1984) and Salinger (1995) extend the analysis to the case of normal and uniform tastes. A simple example, adapted from Adams and Yellen (1976), demonstrates the discriminatory incentives.

There are two goods (1, 2) and four consumers (A–D), whose willingness-to-pay (WTP) for each good is represented by a point in the top panel of Fig. 1. The bottom three panels show the demand for each good (if offered separately) and demand for the bundle of both goods implied by these reservation values. Marginal costs are $c_1 = 20$ for good 1 and $c_2 = 30$ for good 2.

Unbundled sales imply optimal prices of $p_1^* = 60$ and $p_2^* = 90$, yielding consumers surplus (in market 1) of \$30 and (combined) profits of \$140. Consumers surplus and profits in each market (if any) are labelled by CS and Π in the figure. Under bundling, however, perfect negative correlation in tastes for each component imply that all consumers have WTP of \$100, yielding bundled profits of \$200. In this example, bundling permits the monopolist to extract *all* available consumers surplus.

The reduction in preference heterogeneity in the example (and associated surplus extraction) generalizes and is the primary benefit of bundling. It is not sufficient, however. In a more general setting, when bundled sales are preferred to component sales depends on three critical features of preferences and costs. First is the extent of heterogeneity reduction possible from bundling. This increases with the negative correlation in preferences for bundle components, a point made clear by the example.[4] Second is the level of marginal costs for components. Since bundling requires that consumers purchase all goods, some below-cost sales of components can result (e.g. consumers A and D in the example), reducing the gains from bundling. Below-cost sales become more likely the higher marginal costs are relative to the mass of consumer preferences.[5] Third is that bundling requires firms charge a single price. When consumer tastes for components differ considerably (e.g. multiply WTP for one of the example goods by 100), bundling is less attractive than component sales as it permits fewer instruments (prices) to capture consumers' surplus.[6]

[4] Negative correlation, however, is not necessary for bundling to be profitable (McAfee et al., 1989).

[5] Evans and Salinger (2005) further discuss cost-based arguments for bundling.

[6] McAfee et al. (1989) extend the analysis of Adams and Yellen (1976) to consider mixed bundling, the offering of *both* component and bundled sales, and show it always yields (weakly) greater profits than pure bundling. The reason for this is clear: it maintains the benefits of bundling (if any) and strictly increases the number of prices available to capture surplus. Despite this fact, mixed bundling is relatively uncommon, perhaps due to the added administrative costs associated with offering both bundled and component goods.

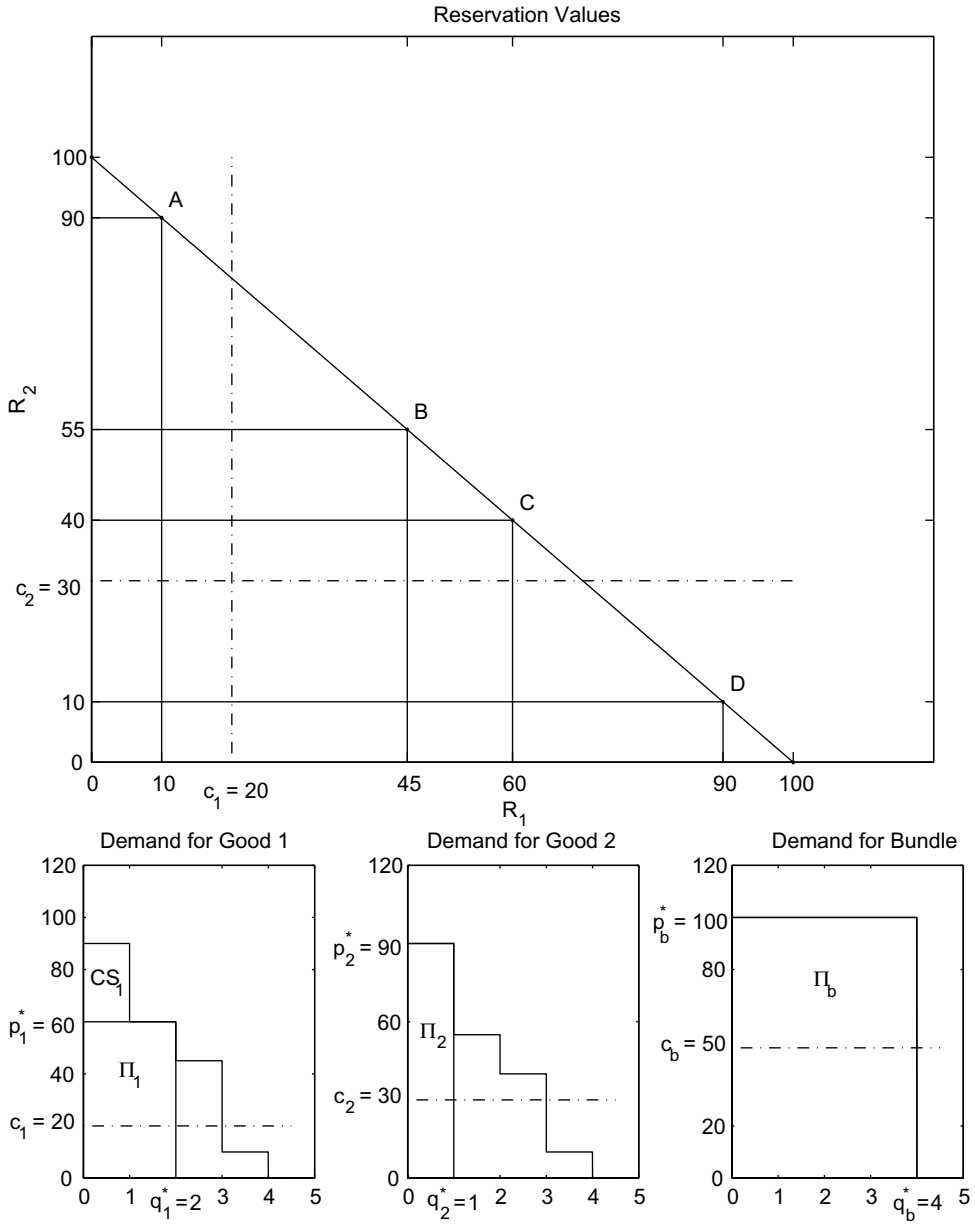

Fig. 1. An example of the discriminatory incentives to bundle.

2.1.2. More than two goods

Recent papers by Bakos and Brynjolfsson (1999) and Armstrong (1999) extend the analysis of bundling to consider multiple goods. If there is no substitutability or complementarity in demand, consumer WTP for bundles is the simple sum of the WTP for the components. Assuming the monopolist cannot observe any individual consumer's WTP but knows the distribution of WTP in the population, he can construct the optimal product

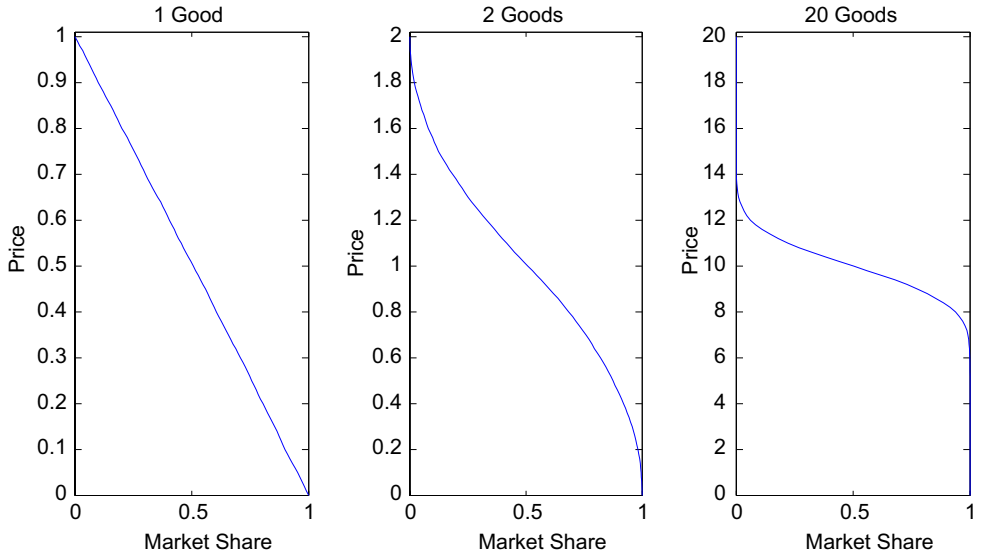

Fig. 2. Bundling homogenizes preferences, flattening demand.

line. While it may appear to be sub-optimal for him to offer a bundle at a fixed fee, the optimal tariff can be quite complex and difficult to calculate, even for simple preference structures (Armstrong, 1996; Rochet and Chone, 1998; Rochet and Stole, 2000).[7]

The consequences of bundling for the distribution of consumer WTP is significant. Bundling aggregates (averages) consumer tastes for the bundle components, x_j. When bundles are large, a Law of Large Numbers (LLN) effect obtains: the distribution of preferences for the bundle becomes more concentrated as n increases (e.g., White, 1984). The implication of this result for the bundle demand curve is demonstrated in Fig. 2, adapted from Bakos and Brynjolfsson (1999). For the case of uniformly distributed tastes (i.e. linear demand for components), the figure presents the demand curve for a bundle of size 1, 2, and 20.[8] As bundle size increases, there are fewer extreme tastes, corresponding to an increasingly flat demand curve and greater consumer surplus extraction.[9] Fig. 1 exhibited a similar effect for just two goods.

Does the monopolist benefit from this reduction in heterogeneity? As in the two-good case, it does when costs are low (discouraging below-cost sales of components) and when tastes are not too extreme (which favors pricing components separately).

2.1.3. The welfare effects of discriminatory bundling

What are the implications of discriminatory bundling for welfare? When costs are zero, Bakos and Brynjolfsson (1999, Proposition 1) find that as bundle size increases, both con-

[7] Armstrong (1999) shows that the proportion of first-best profits obtainable by bundling is given by $\frac{\pi_*}{\pi^*} \geqslant (n+1)^{1/n}(1-\frac{0.97}{\sqrt{n}})$. This implies for a bundle of a size common in the cable television industry (e.g. between 30 and 60), a simple fixed fee tariff yields profits of at least 77–81% of the first-best profit.

[8] Similar effects obtain for other distributions.

[9] This may seem counter-intuitive. For a fixed level of demand (e.g. rotate a linear demand curve around its intersection with the quantity axis), a monopolists profit is higher the more inelastic is demand. Bundling, however, simultaneously *shifts out* and flattens the aggregate demand curve.

sumers surplus and deadweight loss per good converge to zero.[10] As bundle size grows without bound, firms extract all the surplus available in the market. On average, consumers lose, but firms gain by more than consumers lose and total surplus increases.[11]

When marginal costs are positive, bundling becomes less desirable for all of consumers, firms, and society. Bundling with positive marginal costs admits the possibility of below-cost sales, reducing gains to all parties. Indeed, as we show in the next section, it is possible for a monopolist to have the incentive to profitably introduce products that actually reduce total welfare. Regardless, positive costs does not attenuate the central lesson of this literature: bundling can help a monopolist extract consumers surplus and increase profit.

2.2. Bundling and product choice

The previous section took the set of offered products as given. This is inappropriate if bundling itself can increase the set of offered products, to the benefit of consumers, firms, and society as a whole. To address this issue, we therefore consider the incentives facing a monopolist to introduce new goods on either a stand-alone or bundled basis.

2.2.1. Primitives

Suppose a monopolist currently offers a single product and is considering the offer of an additional product either as a stand-alone (à la carte) product or in a bundle with his existing product.

Let p_1 and p_2 be the prices charged by the monopolist for each product if he offers the second on an à la carte basis and let p_{1+2} be the price charged if he offers them as a bundle. Let $w_1(p_1) = D_1(p_1)/N$, $w_2(p_2) = D_2(p_2)/N$, and $w_{1+2}(p_{1+2}) = D_{1+2}(p_{1+2})/N$ be the associated per-capita demand curves and market shares for known market size N. Let the associated per-capita variable cost functions be $C_i(w_i) = c_i w_i$, for $i = \{1, 2, 1+2\}$, where c_i is the marginal cost for product i. At times, we will also allow for per-capita fixed costs, F_i, for offering each product.

Let per-capita consumer surplus, gross profit (i.e. ignoring fixed costs), and gross total surplus for each product, $i = \{1, 2, 1+2\}$, be given by

$$S_i(p_i) = \int_p^{\infty} w_i(v)\mathrm{d}v \tag{1}$$

$$\pi_i(p_i) = p_i w_i(p_i) - C_i(w_i(p_i)) = (p_i - c_i)w_i(p_i) \tag{2}$$

$$W_i(p_i) = \pi_i(p_i) + S_i(p_i) \tag{3}$$

Let $p_i^M = \arg\max_{p_i} \pi_i(p_i)$ be the Profit-maximizing price charged by the monopolist for each product and define the associated (gross) profit, consumer, and total surplus as $\pi_i^M = \pi_i(p_i^M), S_i^M = S_i(p_i^M)$, and $W_i^M = W_i(p_i^M)$. Similarly let $p_i^* = \arg\max_{p_i} W_i(p_i)$ be the welfare-maximizing price for each product with associated (gross) profit, consumer, and total surplus, π_i^*, S_i^*, and W_i^* defined analogously.

[10] The assumptions underlying this result are three: (1) zero marginal costs, (2) independent preferences for components, and (3) free disposal. The second of these can be relaxed as long as preferences for components are not too positively correlated. See Bakos and Brynjolfsson (1999) and Crawford (2006).

[11] Throughout this paper, we take total surplus to be the simple sum of consumers and producers surplus. Other social welfare functions (e.g. a Rawlsian one that maximizes the minimum of the two) would yield very different conclusions.

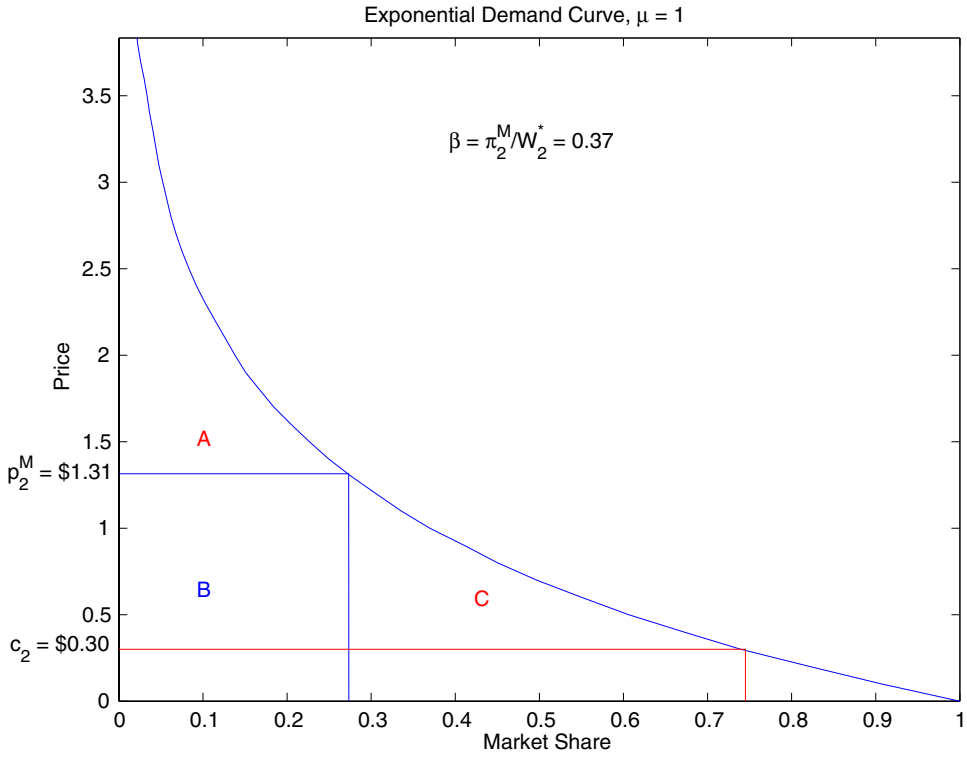

Fig. 3. The incentives to offer stand-alone products.

2.2.2. Incentives for stand-alone products

Assume that there is no substitutability or complementarity in demand between the two products.[12] If the monopolist offers the potential new product on an à la carte basis, his incremental profit is just the profit from that product, π_2^M.

The incentives facing the monopolist in this case can be summarized by Fig. 3.

Displayed is the demand curve corresponding to an exponential distribution of willingness-to-pay (WTP) for the potential product in the population of consumers. The mean and variance of this distribution are both equal to one. Also reported are the profit-maximizing price and market share for this demand curve under the assumption that marginal costs are \$0.30.

Profit-maximizing gross profit, π_2^M, is given by the area B in the figure. Welfare-maximizing gross total surplus, W_2^*, is given by the sum of the areas A–C. If there are fixed costs from introducing the new product, any fixed cost between B and (A + B + C) will prevent the monopolist from introducing the product on an à la carte basis *even though* it could increase social welfare. The reason is simple: the monopolist cannot appropriate the total

[12] All else equal, substitutability (complementarity) will increase (decrease) the monopolist's incentives to offer the product.

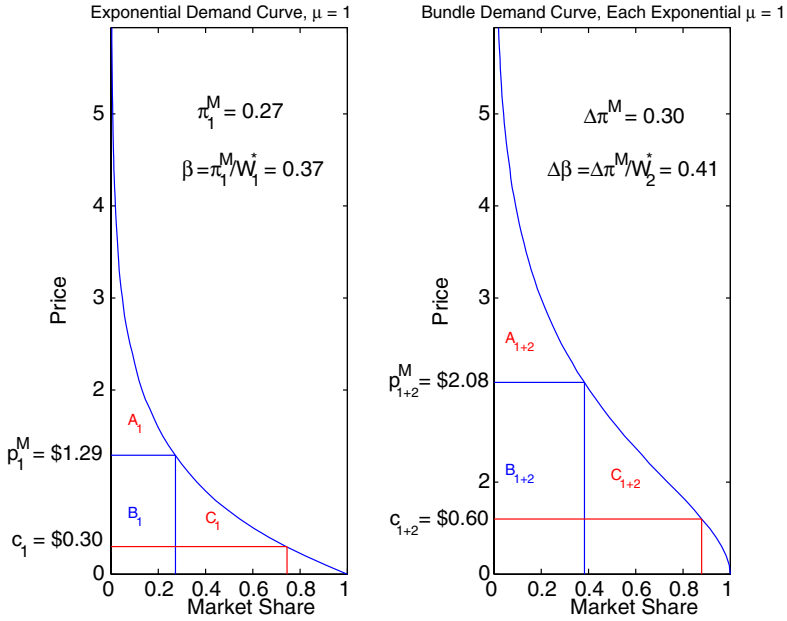

Fig. 4. The incentives to offer products in a bundle.

surplus from the introduction of the product. It loses some to consumers surplus (A) and some to the deadweight loss from monopoly pricing (C).

Spence (1975) introduced $\beta \equiv \pi^M / W^*$ to measure the difference between private and social incentives to offer a new product.[13] $\beta \in [0,1]$ and the larger it is, the more the monopolist can appropriate the total potential surplus from introducing the product. For exponential tastes, the monopolist can only capture 37% of the total surplus created by offering the product.

2.2.3. Incentives for bundles

Now consider the case where the monopolist offers the new product as part of a bundle with his existing product. For simplicity, we assume consumer preferences and marginal costs for each product are the same as in Fig. 3. Fig. 4 describes the consequences of bundling on the monopolist's incentives.

Pictured in the left panel is the demand for the monopolist's existing product when WTP is distributed as an exponential in the population of households. Pictured in the right panel is the demand for a bundle of the two products when WTP for each is distributed as an exponential.

Bundling changes the calculus of product choice. When bundling, the monopolist compares the *incremental* profit of adding the good to his existing bundle ($\Delta\pi^M = \pi_{1+2}^M - \pi_1^M = B_{1+2} - B_1$) to any fixed costs he might incur. From an efficiency perspective, the question is

[13] Technically he introduced the idea to measure the difference between private and social incentives for selecting a quality for a product necessarily offered by the monopolist, but the incentives in both cases are similar.

whether this change in profit is more or less than the incremental surplus from offering the product on an à la carte basis, i.e. whether $\Delta\pi^M$ is closer or further to W_2^*.[14] Let $\Delta\beta = \Delta\pi^M/W_2^*$. The figure demonstrates that bundling can help solve the product choice problem. Comparing β and $\Delta\beta$, the figure shows that for the exponential distribution, adding the second product to the bundle increases the share of the surplus the monopolist can capture from that product.

Bundling also changes the welfare consequences of additional products. In the à la carte case, whenever a firm introduces a product it necessarily increases both consumer and total welfare (cf. Fig. 3). There is no such guarantee when adding a product to a bundle. Adding a new product can decrease consumer welfare ($\Delta S^M \equiv S_{1+2}^M - S_1^M$), decrease total welfare ($\Delta W^M \equiv W_{1+2}^M - W_1^M$) or both. The reason is that bundling enhances profitability by exploiting consumer preferences *across goods*. It may therefore be profitable to add a new product to a bundle solely to increase surplus extraction on other products, even if adding the new product decreases total welfare. Similarly, even if some consumers benefit from the addition of a new product to the bundle, their gains may be outweighed by losses to existing consumers of the bundle.

2.2.4. Mean preferences, marginal costs, and correlation

What factors influence when bundling enhances incentives to offer new products? When it reduces welfare? As earlier, two key factors determine the consequences of bundling on profits and welfare: the difference between marginal cost and mean WTP for components and correlation in that WTP for components.[15]

To explore the effect of each of these factors, consider again a monopolist that currently offers a bundle and is considering offering a new product, either on an à la carte basis or as part of his existing bundle. Suppose for convenience he could select among a continuum of potential products that differ in several dimensions: the distribution, mean, and variance of WTP for the product, the marginal and fixed costs the monopolist would have to pay, and the degree of correlation in household tastes between the new product and the existing bundle.[16]

Fig. 5 demonstrates the influence of the difference between mean WTP and marginal costs on the profit and welfare of bundling while Fig. 6 demonstrates the influence of negative correlation on the profit and welfare of bundling. In each figure, 4 panels are shown. The top two panels in each figure present the efficiency consequences of bundling (i.e. "How close does bundling get to ensuring offerings that *could* increase total welfare?"). Reported are the incremental profit from bundling ($\Delta\Pi^M$) or à la carte sales (Π_2^M) as well as the total surplus available from offering it on an *efficient* à la carte (W_2^*) or bundled (ΔW^*) basis.[17] The bottom two panels in each figure present the actual welfare conse-

[14] An alternative efficiency criterion would be to compare the change in profit with the change in welfare from offering the product in the bundle (i.e. $\Delta\pi^*$ versus ΔW^*). While reasonable (and the approach taken by Anderson and Coate, 2005), this appears further from the original intent of the product choice problem.

[15] Schmalensee (1984) establishes the importance of these factors in a numerical analysis with two goods. Fang and Norman (2005) confirm the importance of the first in general settings.

[16] In particular, let preferences for the bundle be distributed normally with mean WTP of 30, a standard deviation of 8, and let marginal costs for the bundle be 9. Unless otherwise stated, let mean WTP for the potential new product be a truncated normal with mean 1 and standard deviation 1 and let its marginal cost be 0.30. These values are not critical; they were chosen to facilitate identifying the influence of each of the factors.

[17] That is, the total surplus when setting price equal to marginal cost.

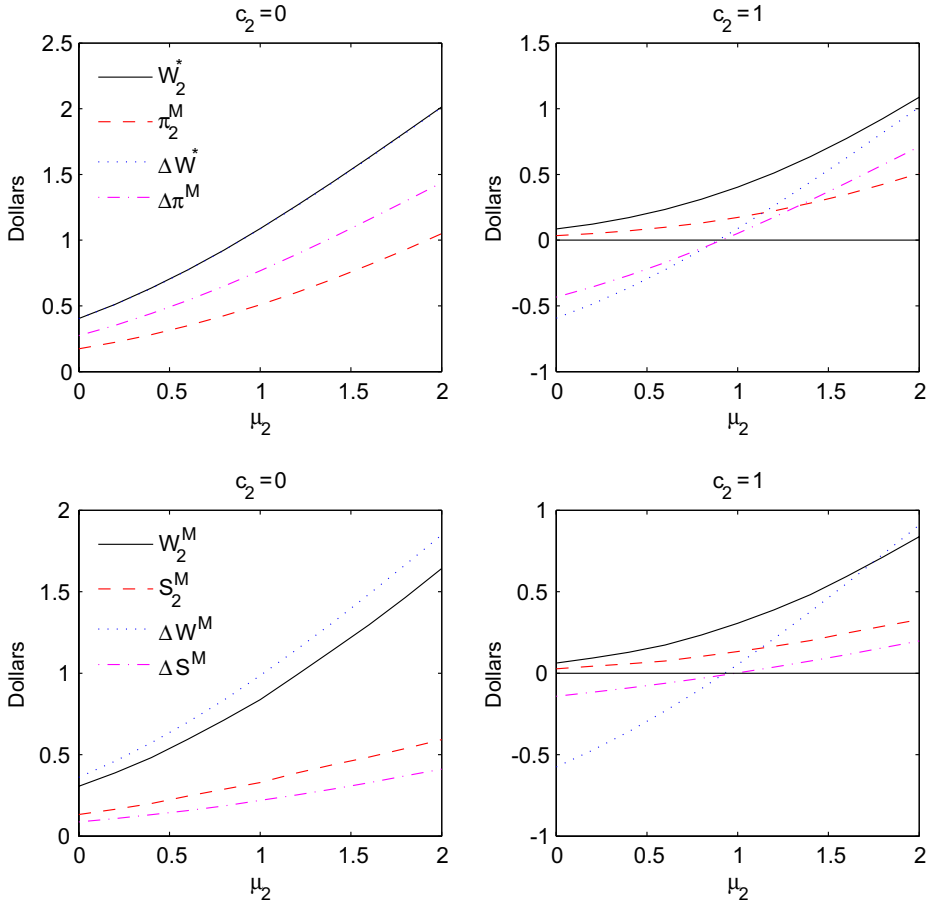

Fig. 5. The Importance of marginal costs relative to mean preferences on À-La-Carte versus bundling outcomes.

quences of bundling (i.e. "What *actually* happens to consumer and total surplus from bundling?"). Reported are the incremental total and consumers' surplus from à la carte and bundled sales (W_2^M, S_2^M, ΔW^M, and ΔS^M). Of course, actual welfare (in the bottom panels) is always less than potential welfare (in the top panels) due to the distortions caused by monopoly pricing.

Fig. 5 demonstrates the importance of marginal costs for the profit and welfare of à la carte versus bundled sales. When costs are zero (left-hand panels), total potential welfare from bundled and component sales are equal ($W_2^* \approx \Delta W^*$) and bundling yields greater profit. For any potential product, therefore, there are a range of fixed costs for which that product would be offered in a bundle and not offered on an à la carte basis and total welfare would increase. Consumers, too, would benefit from the offering. When costs are positive, however, whether bundling could be more efficient than à la carte sales depends on the level of mean WTP for the product. For low levels of mean WTP (i.e. marginal costs higher than mean tastes), bundling is both profit- and welfare-reducing. For higher levels of mean WTP, however, bundling does better, providing greater profit (and thus stronger

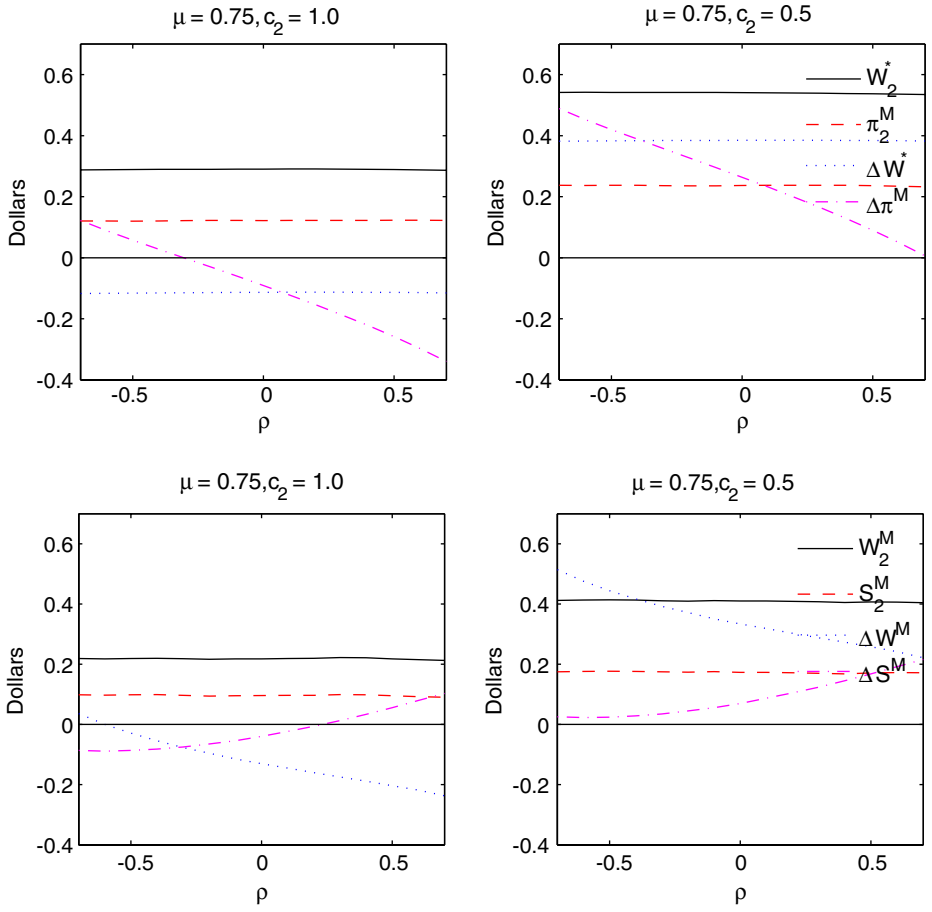

Fig. 6. The importance of correlation and cost on À-La-Carte versus bundling outcomes.

incentives for product introductions) when tastes are approximately 40% greater than costs. Note also in the bottom panels that consumers' surplus from bundling is everywhere lower than that from à la carte sales.

Fig. 6 demonstrates the importance of negative correlation (and costs) for the profitability of bundled sales. In all the panels, the correlation between the existing bundle and the new product is allowed to vary between −0.7 and 0.7.[18] In the left-hand (right-hand) panels, mean tastes are slightly below (above) costs. While à la carte profit and welfare (Π_2^M, S_2^M and W_2^M) are invariant to correlation, the profit and welfare consequences of bundling ($\Delta\Pi^M$, ΔS^M, and ΔW^M) are highly dependent on it. For large negative correlation and costs high relative to tastes (the left-hand panels), consumer and total surplus can actually fall with the bundling of new goods. This cannot happen under à la carte sales. The right-hand panel demonstrates the importance of high marginal costs to this conclusion. It duplicates the left-hand panel

[18] This is a high but not unreasonable level of correlation. It is possible to generate correlations of this order if one could identify a potential product that appealed (exclusively) to the bottom 10–11% of the population of tastes for the existing bundle.

after cutting marginal costs in half. While profitability is still strongly decreasing in correlation, bundling never reduces welfare. It is therefore the *interaction* of high costs and negative correlation that can yield bundling that reduces total welfare.

3. Bundling, product choice, and welfare in cable television markets

The previous section demonstrated that bundling generally transfers surplus from consumers to firms, but can also encourage the introduction of products that would not otherwise be offered. This section applies these ideas to the cable television industry. Cable television systems choose a portfolio of television networks, bundle them into services, and offer these services to consumers in local, geographically separate, cable markets. The three main types of program networks offered on cable are *broadcast networks*, *cable networks*, and *premium networks*.[19] Broadcast and cable networks are typically bundled and offered as *Basic* and *Expanded Basic Services* while premium programming networks are typically unbundled and sold as *Premium Services*.

The bundling of cable networks into Basic and Expanded Basic services have recently come under scrutiny by both law- and policy-makers. Frustrated by ever-increasing prices, consumers and their representatives in the federal government have asked if unbundled sales might not be a potential solution. If consumers select just those channels that they prefer, might not cable bills fall? Cable systems and the television networks offered on them have been vocal in their opposition. They argue that à la carte sales would (i) increase costs, (ii) decrease advertising revenues, and (iii) reduce the viability of (especially small, niche) networks.

To address these questions, we calibrate the model above to an "average" system in the cable television industry and simulate the effects of two à la carte proposals considered in the popular press. In so doing, we analyze the pricing and bundling for this system's most popular Expanded Basic service. A recent survey of cable television systems conducted by the Federal Communications Commission (FCC) found that the average US cable system charged $45.32, had a market share of 72%, and offered 45 Expanded Basic channels (FCC, 2005a,b). Surveying the population of cable systems from Warren (2005), we selected California Cable of Monterey, California as our sample system.[20] This system's most popular Expanded Basic service offered 50 cable networks, charged a price of $44.05, and had a market share of 74%.

We call our two à la carte scenarios "Full À La Carte" and "Theme Tiers". In both proposals we assume that before households can purchase any networks on an à la carte basis, they must first purchase a "Limited Basic" bundle consisting of all available broadcast and public interest channels offered in Monterey. For analytical convenience, we assume that all households value this bundle at $5 and that California Cable of Monterey therefore charges a price of $5 for it.[21] In the "Full À La Carte" scenario, we assume that California Cable of

[19] Examples of each type are ABC, CBS, NBC, and FOX for broadcast networks, MTV, CNN, and ESPN for cable programming networks, and HBO and Showtime for premium networks.

[20] California Cable is owned by Comcast, the largest Multiple System Operator (MSO) in the United States.

[21] Modelling household preferences for broadcast networks is more challenging that for cable networks as cable systems do not generally receive payment for them. Instead, the owners of television networks generally negotiate carriage agreements for their affiliated cable networks. Furthermore, modelling the demand for and pricing of à la carte networks in the presence of heterogeneous tastes for the "Limited Basic" bundle is much more complicated. See Crawford and Yurukoglu (2007) for a detailed discussion of this issue.

Monterey offers every current cable network in the most popular Expanded Basic bundle on an à la carte basis instead. In the "Theme Tier" scenario, we assume that they instead bundle networks with similar subject matter into 11 tiers and offer these tiers on an à la carte basis. In both scenarios, we assume the bundle is no longer offered.[22] The allocation of networks into the theme tiers is described in Table 2.

Assumptions. Before beginning, it is worth mentioning six important assumptions implicit in this analysis. First, as described above, we are not considering the impact to the potential network's advertising revenues of being offered à la carte instead of in a bundle. Many industry participants have argued viewership and advertising revenue will be (possibly substantially) lower under à la carte (Booz Allen Hamilton, 2004; Mandel, 2004).[23] Second, we assume that marginal costs to cable systems are positive. This reflects institutional reality: cable networks charge "affiliate fees" (in units of dollars per subscriber per month) to cable systems for the right to carry that network on a given cable system.[24] Third, in the simulations to follow, we must make assumptions about the marginal costs systems would pay in an à la carte world. For our "Full À La Carte" scenario, we assume the cable system and programming network share equally in the revenues from à la carte.[25] For our "Theme Tiers" scenario, we assume marginal costs to systems are the same as they are under the bundle. As these marginal costs are important determinants of outcomes and welfare under à la carte, we discuss the robustness of our results to alternative assumptions on costs after presenting the baseline results. Fourth, we assume that there are no fixed costs to the cable system associated with offering an additional channel on either an à la carte or bundled basis.[26] Fifth, we assume that the cable system maximizes *short-run* economic profits.[27]

[22] Economic theory has strong predictions about such "mixed bundling": it further increases firm profitability and reduces consumer welfare (McAfee et al., 1989).

[23] The two primary sources of viewer loss often articulated under à la carte are the unwillingness of some households to purchase a network that they view infrequently and the inability of households to sample new programming, a typical pre-cursor to frequent viewing.

[24] One may argue that the appropriate marginal cost for welfare purposes is zero as that better reflects the economic cost to society of distributing television networks by satellite. Even so, bundling can still be inefficient: there can be values of fixed costs exceeding the gross total surplus created by a potential new product for which it is still profitable for the monopolist to offer it. As for our earlier results, this is more likely the more negatively correlated are tastes for networks.

[25] While contracts between networks and cable systems are sensitive competitive information, industry sources confirm this is a typical revenue sharing arrangement in these contracts (when included).

[26] On institutional grounds, substantial fixed costs *to systems* are unlikely. For the average cable system, adding a network requires negotiating a carriage agreement with the network and including it in the programming lineup of the system. The only potential cost of any consequence would arise if a cable system didn't have the technical capability of offering à la carte networks in a low-cost way. Since most cable systems now control access to à la carte (e.g. Premium) networks using addressable converters, the "set-top boxes" that decompress and unscramble television signals before passing them to the television, adding a network merely requires re-programming a system's converters and is effectively costless. There could be costs to households, however, if they previously did not use an addressable converter. Furthermore, without addressable converters, there could be substantial incremental fixed costs of offering à la carte networks.

[27] Television content is now becoming available over the Internet (both legally and illegally), introducing the possibility of disintermediation of cable systems over time. Furthermore, early indications are that this content is likely to be available on an à la carte (indeed individual program) basis. If cable operators are able to effectively maintain copyright protection (a big "if"), our view is that this represents a form of "mixed bundling" that simply further increases firm profitability (cf. Footnote 22). That being said, there could be long-run consequences of bundling by cable systems: it may encourage consumers to seek alternative sources of distribution.

The final assumption relates to competition. The model in this paper is that of a monopoly cable provider. A typical US cable system, however, competes with two satellite providers and faces the prospect of further competition from local telephone companies, internet delivery of television programming, and other distribution technologies.

There are three potential impacts of competition on our analysis. The first relates to the potential impact of satellite competition on recovering preferences for bundles. We will momentarily be recovering an estimate of the distribution of household WTP for Expanded Basic service in Monterey based on an assumption that the system there is a monopolist. But is it? In a way, it is: satellite systems select their programming and prices on a national basis, not in response to the products and prices offered (just) in Monterey. In any local cable market, national satellite pricing implies the local cable system is best modelled as a monopolist on the *residual* demand defined by the aggregate demand for multi-channel video programming less those households that purchase satellite service.[28] The assumption in this paper is that households in Monterey purchase either satellite or cable based on factors uncorrelated with the WTP for the programming offered by California Cable of Monterey.[29] We then measure the distribution for WTP for networks and bundles of those networks for the cable households.

A second issue relates to the impact of competition when networks are offered à la carte. If all distributors carry all networks, there is little to differentiate a network offered on cable versus satellite. Competition is therefore likely to be stronger with à la carte sales.[30] What impact would this have on our welfare comparisons of à la carte and bundled sales? If stronger competition reduced prices for individual networks under à la carte, the result would be increased consumer welfare for those networks *that continued to be viable.* The analysis in the previous section suggests, however, that fewer networks would be viable, making the aggregate welfare effects unclear.[31]

While not the intent, the consequence of these assumptions is to provide a fairly favorable scenario for à la carte pricing. From a policy perspective, this scenario is useful for two reasons. First, it identifies whether à la carte could *possibly* improve welfare. Second, it identifies the areas of uncertainty that must be resolved before à la carte could be considered a viable policy option. While addressing the advertising market and competition in distribution is beyond the scope of this paper, we can address the consequence of our assumptions on costs to our conclusions. We do so after presenting the baseline results.

[28] Chu (2006) makes a similar assumption.

[29] We will go wrong if satellite consumers are disproportionately selected from some portion of the distribution of WTP for multi-channel video programming. In practice, this could go either way – at least one of the two US satellite providers (DirecTV) offers a broader range of programming, including exclusive sports programming, while the other (Dish Network) offers programming comparable (if not better) than most local cable systems at a lower price.

[30] Bundling likely softens competition by differentiating providers, particularly after accounting for non-programming services provided by some distributors (e.g. high-speed internet and telephone service by some cable systems). Even if an à la carte regime required the purchase of a minimal bundle from a distributor and there are moderate costs to switching distributors, a network offered on an à la carte basis is likely to be less differentiated than if it were bundled.

[31] The product choice literature emphasizes that competitive markets may provide too many products and there is some evidence of this in radio markets (Berry and Waldfogel, 1999). This is unlikely to be true for cable *networks*, however, as competing distributors share in covering the fixed costs of programming networks rather than duplicating them.

Table 1
Market outcomes and welfare: Baseline Bundle and two À La Carte scenarios

	Baseline: Bundle	Scenario 1: Full À La Carte	Scenario 2: Theme Tiers
Market outcomes			
Total price	$43.06	$78.54	$50.22
Average cable network price	$0.86	$1.47	$0.90
Average market share (%)	75.6	34.1	44.1
Welfare (all networks viable) per-household			
Consumer	$10.37	$17.17	$11.84
Producer	$20.52	$11.44	$17.29
Total	$30.89	$28.61	$29.13
Welfare (considering network exit)			
Difference in profit adding network to the bundle versus scenario	–	$12.31	$6.48
Network exit required to equate consumer surplus between bundle and scenario	–	41	24

3.1. The baseline results

Our policy simulations are done in two stages. In the first stage, we recover the distribution of household WTP for bundles and marginal costs consistent with observed market outcomes (prices and market shares) in Monterey. Given that distribution, we then calculate baseline welfare measures (consumer surplus, (gross) producer surplus, and (gross) total surplus) implied by these preferences and costs. In the second stage, we calculate market outcomes and welfare measures under "Full À La Carte" and "Theme Tiers", two policy proposals that have been discussed in the popular press. The functional form and distributional assumptions underlying each stage are introduced in turn.

3.1.1. The first stage: WTP for bundles and baseline welfare

The most popular Expanded Basic is available to consumers in Monterey at a price of $44.05 with 72% of households subscribing. What then must be the distribution of WTP for this service? What are California Cable of Monterey's marginal costs? To solve for these objects, we make two assumptions. First, we assume the WTP for bundles of networks are distributed normally with mean μ_B and variance σ_B^2. In practice, this is a weak assumption: the distribution of WTP for individual networks could be almost anything and the resulting WTP for bundles of those networks would be normal.[32] Second, we assume that marginal costs in Monterey are 28% of the price.[33] Under these assumptions (and after taking out $5 for the Limited Basic bundle), we find WTP for Expanded Basic service in Monterey is normally distributed with mean $47.00 and variance $151.29.

Given this result, we can then calculate the welfare effects of the existing bundle. These are given in the first column of Table 1. As can be seen there, although we come close to matching the observed price and market share for Expanded Basic cable service in Mon-

[32] The reason: Central Limit Theorems (CLTs). In statistics, CLTs show that the distribution of a sum of random variables tends to be normally distributed as long as the individual components are not too positively correlated. See Crawford (2006) for a deeper discussion of this issue applied to bundles of cable networks.
[33] This is consistent with industry sources (Halfon, 2003, footnote 78; FCC, 2003).

Network	Penetration/ Cvg% (Total US HH)	Avg Rtg	Wkly Cume	Network	Penetration/ Cvg% (Total US HH)	Avg Rtg	Wkly Cume
The Discovery Channel	82	0.5	29.6	MSNBC	75	0.2	15.2
ESPN	82	0.6	26.2	COURT	74	0.3	15.7
TNT	82	1.0	38.7	Black Entertainment TV	72	0.3	12.7
USA	82	0.8	37.3	BRVO	70	0.2	16.8
A & E Network	81	0.5	27.0	The Travel Channel	69	0.1	15.6
CNN	81	0.4	21.5	CMT	68	0.1	11.5
Lifetime TV	81	0.8	27.7	Speed Channel	56	0.1	6.0
NICK	81	1.4	32.9	TV Guide Channel	56	0.1	14.3
SPIKE TV	81	0.4	25.5	GOLF	55	0	2.8
TBS Network	81	0.8	39.1	Superstation WGN	55	0.2	16.0
The Weather Channel	81	0.2	22.7	Hallmark Channel	53	0.3	10.8
CNBC	80	0.1	8.7	Outdoor Life Network	53	0	5.4
ESPN2	80	0.2	20.6	GAME	50	0.1	6.5
ABC Family	80	0.4	23.9	WE: Women's Ent	50	0.1	7.5
The History Channel	80	0.5	24.5	ESPN Classic	49	0	4.0
Headline News	80	0.1	13.8	Discovery Health	48	0.1	6.4
MTV	80	0.5	26.6	OXYG	47	0.1	9.8
TLC	80	0.5	25.4	National Geographic C	44	0.1	6.2
VH1	80	0.2	24.4	Toon Disney	40	0.1	6.4
American Movie Classics	79	0.4	25.0	TECH TV	40	0.0	2.4
Comedy Central	79	0.4	24.0	Lifetime Movie Network	38	0.2	7.7
FOXNC	79	0.6	19.1	ESPNEWS	37	0	3.5
Home and Garden TV	79	0.4	19.1	BBC- America	35	0	2.4
TOON	79	0.8	23.7	NOGGIN/The N	35	0.1	3.8
Animal Planet	78	0.3	19.8	FUSE	33	0	1.9
Entertainment TV	78	0.2	25.6	SOAPNET	33	0.1	2.6
Disney Channel	77	0.9	26.4	FITTV	31	0	1.1
FOOD	77	0.3	17.8	Discovery Times Channel	30	0	2.0
FX	77	0.4	27.5	Great American Country	24	0	2.0
SCIFI	77	0.4	19.0	The Outdoor Channel	24	0.0	2.0
TV Land	76	0.4	18.4	Turner South	10	0.0	1.5

Source: Nielsen Television Activity Report, Quarter 1, 2004, from Mandel (2004).

Fig. 7. Weekly cume for cable networks.

terey, we don't match them exactly.[34] For our predicted outcomes, the average cable subscriber receives a surplus of \$13.72 and California Cable earns average gross profits of \$27.14 for a gross total surplus of \$40.86. Similar values for the average Monterey household, cable subscriber or not, are \$10.37, \$20.52, and \$30.89.[35]

3.1.2. The second stage: preferences for networks and À La Carte welfare

To simulate market outcomes and welfare in an à la carte world, we must again make assumptions about the distribution of WTP and marginal costs, this time for each network

[34] For internal consistency, all the counterfactual policy comparisons presented in the paper use our predicted values as the baseline.

[35] Per-household measures prove useful later for comparisons with the à la carte scenarios.

offered in Monterey. We acknowledge up front that there are many possible assumptions one could make that would yield identical values for μ_B and σ_B^2 that we recovered in the first stage. We've tried to base our assumptions on institutional patterns known in the industry; estimating these directly from data is the topic of related work in progress (Crawford and Yurukoglu, 2007).

We assume preferences for each network have a very particular form. For each network, j, in Monterey, we assume that only a portion of households, γ_j, have positive WTP for that network; the remaining proportion, $1-\gamma_j$, value it at zero.[36] We further assume that among those that have positive WTP, tastes for each network j are distributed independently of other networks as a log-normal with location parameter μ_j and (common) shape parameter, σ^2.[37] We consider the impact of correlation in tastes for networks after presenting the baseline results.

What of costs? Kagan World Media (2007) reports average affiliate fees for most of the networks offered by California Cable in Monterey.[38] Based on the assumption that marginal costs are 28% of the Expanded Basic price in Monterey (net the $5 for Limited Basic), this implies California Cable gets a 8.9% discount relative to these national averages.[39] Applied to each network this implies its marginal cost $= c_j = 91.1\%^{*}\text{Kagan}_j$. Table 2 reports the average Kagan costs.

What of marginal costs in an à la carte world? There are both institutional and theoretical reasons to believe television networks would negotiate higher prices from cable systems if they are offered on an à la carte basis.[40] Furthermore, marketing, operating, and equipment costs could rise under à la carte sales.[41] As described earlier, we assume that systems share revenue in the "Full À La Carte" scenario and that marginal costs do not change in the "Theme Tier" scenario.

Under these assumptions, there are two sets of free parameters, the network-specific means of WTP, μ_j, and the scale parameter, σ^2. To pin down μ_j, we assume mean tastes for each network is a constant multiple of the (estimated) affiliate fee charged to California Cable in Monterey, i.e. $\mu_j = \lambda c_j$. This provides enough structure to recover the distribution of tastes for each network: simply solve for the λ and σ^2 such that the sum of the distributions of WTP for the individual networks equals a normal distribution with mean μ_B and variance σ_B^2. Doing so yielded $\hat{\lambda} = 4.3$ and $\hat{\sigma}^2 = 0.23$.

[36] In our simulations, we assume that γ_j equals 2.5 times the weekly cumulative viewing of each network from a given week in 2004. The weekly cumes for cable networks for the first quarter of 2004 are taken from Mandel (2004) and shown in Fig. 7.

[37] The mean and variance of a log-normal with these parameters is $EX_j = e^{\mu_j+\sigma^2/2}$ and $VX_j = (e^{\sigma^2}-1)e^{2\mu+\sigma^2}$.

[38] Networks offered that did not have affiliate fee data were Headline News, Telemundo, California Channel, KMWB, and the shopping networks (Home Shopping Network, QVC, and ShopNBC). We assumed a low WTP for shopping networks given that the networks generate most of their revenue from advertising and probably are provided to systems at low or zero cost. For the remaining, we assigned to them the median cost of a cable network. If anything, this likely overstates their actual costs.

[39] This is not surprising. Comcast (the owner of California Cable) is the largest operate of cable systems in the US and is known to be an aggressive negotiator with program networks.

[40] Kagan Media Research (2005) "estimates TV channel operators would need to raise per-capita channel carriage fees by a multiple of four to offset a 50% loss of subscribers from big basic bundles". This general pattern of higher affiliate fees for à la carte networks is an equilibrium outcome of a model by Rennhoff and Serfes (2005).

[41] For example, marketing costs for (à la carte) Premium cable networks are in the range of 15–25% of sales, while those for (bundled) Expanded Basic cable networks are 2–6% of sales (Booz Allen Hamilton, 2004, Figure 16). Similarly, bundling (or alternatives like subscriber-selected tiers) are much less complex, saving on costs (Chu et al., 2006; Wildman, 2006).

Table 2
Theme tiers and networks costs

Tier	Network name	National average network cost
Sports	ESPN	$2.28
	ESPN 2	$0.21
	Golf Channel	$0.20
	Outdoor Life Network	$0.11
	Fox Sports Net	$1.34
Family	Nickelodeon	$0.38
	ABC Family Channel	$0.21
	Cartoon Network	$0.14
	Disney Channel	$0.76
	Hallmark Channel	$0.03
General Interest	Turner Network TV	$0.82
	USA Cable	$0.44
	Lifetime	$0.20
	Spike TV	$0.17
	TBS Superstation	$0.34
	FX	$0.32
	TV Land	$0.08
	oh! Oxygen	$0.05
News and Public Affairs	CNN	$0.43
	Weather Channel	$0.09
	CNBC	$0.25
	Headline News	$0.09*
	Fox News Channel	$0.22
	MSNBC	$0.14
	C-SPAN	$0.05
	C-SPAN 2	$0.05
Movie	Arts & Entertainment	$0.20
	American Movie Classics	$0.22
Music and Entertainment	MTV	$0.26
	VH1	$0.12
	BET	$0.13
	Bravo	$0.13
	Country Music TV	$0.04
Spanish	GalaVision	$0.03
	Telemundo	$0.09*
Shopping	Home Shopping Network 2	$0.01*
	QVC	$0.01*
	ShopNBC	$0.01*
Science and Nature	Discovery Channel	$0.24
	Learning Channel	$0.15
	Animal Planet	$0.07
Specialty	History Channel	$0.17
	Comedy Central	$0.10
	HGTV	$0.06
	E! Entertainment Television	$0.19
	Food Network	$0.06

(*continued on next page*)

Table 2 (*continued*)

Tier	Network name	National average network cost
	Court TV	$0.10
Other	TV Guide Channel	$0.03
	California Channel	$0.09*
	KMWB (WBN) Minneapolis-St. Paul	$0.09*

Notes: Reported are the allocation of cable networks into theme tiers for use in the "Theme Tier" scenario (cf. Table 1) and the national average per-subscriber cost for that network from Kagan World Media (2007). Costs for starred networks are estimated; see Footnote 38 for details.

3.1.3. Scenario 1: Full À La Carte

We first consider our results from full à la carte pricing. Prices for channels ranged from a high of $9.34 for ESPN to a low of $0.22 for GalaVision (a Spanish-language network), with an average price per network of $1.47 and an average market share of 34.1%.[42] Table 3 lists market outcomes and estimated per-household welfare for each of the channels offered in Monterey. If a consumers were to buy all the channels previously offered in the bundle, the total price would be $78.54 (including the $5 for "Limited Basic"), slightly less than double the bundled price.

What are the welfare consequences of full à la carte? We answer this question in two parts. We first answer assuming that each of the networks offered in Monterey continues to be offered. Under this assumption, the second column of Table 1 shows that consumers are (much) better off and firms are (much) worse off, at a moderate cost to society. Average per-household consumers surplus under à la carte is $17.17 (a 65.6% increase), gross firm profit is $11.44 (a 44.2% decrease), and gross total surplus is $28.61 (a 7.4% decrease). If our assumptions are accurate, it is no wonder firms are adamantly opposed to à la carte.

In Section 2.2, we demonstrated, however, that because bundling is more profitable than à la carte sales, some channels may no longer be viable under à la carte. Similarly, there may be fixed costs to cable systems that exceed their profit from a network offered on an à la carte basis. We address this issue in two ways. First, we calculate the profit of each network from à la carte sales versus the incremental profit that adding the network would bring to a bundle containing all of the other networks offered in Monterey. As expected, incremental per-household bundling profits are on average $12.31 higher (107.4% of per-household à la carte profits), suggesting that there could be values of fixed costs such that networks would be offered under bundling but not under à la carte sales. Could these losses outweigh the aggregate consumer surplus gains from à la carte? To address this question, we rank networks by their à la carte profit and calculate how many would have to exit from the market in order for à la carte to yield surplus to the average consumer no higher than they get from purchasing the bundle. The results are quite stark. Fully 41 of the 50 offered cable networks would have to exit for consumers surplus under full à la carte to be no higher than in a bundled world.[43] While some networks would surely exit, it seems unlikely that so many would, suggesting consumer welfare would likely be higher under "Full À La Carte" than bundled sales.

[42] These calculations and those for Theme Tiers subtract off the $5.00 for Limited Basic when calculating the average price per network or price per tier.

[43] The last four networks that would have to be dropped are estimated to be AMC, The Discovery Channel, CNBC, and MTV.

Table 3
Full À La Carte simulation results

	Price	Market share (%)	Per household surplus			Cost
			Consumer	Producer	Total	
Discovery Channel	$0.87	53	$0.34	$0.23	$0.57	$0.43
ESPN	$9.34	47	$3.24	$2.17	$5.41	$4.67
Turner Network TV	$2.27	69	$1.17	$0.78	$1.95	$1.13
USA Cable	$1.27	66	$0.62	$0.42	$1.04	$0.64
Arts & Entertainment	$0.78	49	$0.29	$0.19	$0.48	$0.39
CNN	$2.12	39	$0.62	$0.41	$1.03	$1.06
Lifetime	$0.77	50	$0.29	$0.19	$0.48	$0.38
Nickelodeon	$1.23	59	$0.55	$0.36	$0.91	$0.61
Spike TV	$0.71	46	$0.24	$0.16	$0.41	$0.35
TBS Superstation	$0.93	69	$0.48	$0.32	$0.81	$0.47
Weather Channel	$0.42	41	$0.13	$0.09	$0.22	$0.21
ABC Family Channel	$0.93	43	$0.30	$0.20	$0.50	$0.47
CNBC	$3.07	15	$0.36	$0.24	$0.60	$1.54
ESPN 2	$1.09	37	$0.30	$0.20	$0.50	$0.54
Headline News	$0.70	24	$0.13	$0.09	$0.21	$0.35
History Channel	$0.74	44	$0.24	$0.16	$0.41	$0.37
Learning Channel	$0.63	46	$0.21	$0.14	$0.36	$0.31
MTV	$1.04	48	$0.37	$0.25	$0.62	$0.52
VH1	$0.53	43	$0.17	$0.11	$0.28	$0.26
American Movie Classics	$0.93	45	$0.32	$0.21	$0.53	$0.47
Cartoon Network	$0.64	42	$0.20	$0.13	$0.33	$0.32
Comedy Central	$0.45	42	$0.14	$0.10	$0.23	$0.23
Fox News Channel	$1.24	34	$0.31	$0.21	$0.52	$0.62
HGTV	$0.34	34	$0.09	$0.06	$0.14	$0.17
Animal Planet	$0.38	35	$0.10	$0.07	$0.17	$0.19
E! Entertainment Television	$0.79	46	$0.27	$0.18	$0.45	$0.39
Disney Channel	$3.06	47	$1.09	$0.73	$1.81	$1.53
Food Network	$0.36	32	$0.09	$0.06	$0.14	$0.18
FX	$1.24	49	$0.46	$0.30	$0.76	$0.62
TV Land	$0.47	32	$0.11	$0.08	$0.19	$0.23
MSNBC	$0.99	27	$0.20	$0.13	$0.33	$0.50
Court TV	$0.69	28	$0.14	$0.10	$0.24	$0.34
BET	$1.10	23	$0.19	$0.12	$0.31	$0.55
Bravo	$0.83	30	$0.19	$0.12	$0.31	$0.41
Country Music TV	$0.37	21	$0.06	$0.04	$0.10	$0.19
TV Guide Channel	$0.23	25	$0.04	$0.03	$0.07	$0.11
Golf Channel	$7.72	5	$0.28	$0.19	$0.47	$3.86
Hallmark Channel	$0.30	19	$0.04	$0.03	$0.07	$0.15
Outdoor Life Network	$2.21	9	$0.15	$0.10	$0.26	$1.10
Oh! Oxygen	$0.54	18	$0.07	$0.05	$0.12	$0.27
C-SPAN	$5.18	2	$0.07	$0.05	$0.12	$2.59
C-SPAN 2	$5.44	2	$0.07	$0.05	$0.12	$2.72
California Channel	$0.64	27	$0.13	$0.09	$0.22	$0.32
Fox Sports Net	$5.44	47	$1.95	$1.28	$3.23	$2.72
GalaVision	$0.22	27	$0.04	$0.03	$0.07	$0.11
Home Shopping Network 2	$0.35	5	$0.01	$0.01	$0.02	$0.18
KMWB	$0.64	27	$0.13	$0.09	$0.21	$0.32
QVC	$0.35	5	$0.01	$0.01	$0.02	$0.18
ShopNBC	$0.36	5	$0.01	$0.01	$0.02	$0.18
Telemundo	$0.64	27	$0.13	$0.09	$0.22	$0.32

Table 4
Theme Tier simulation results

	Price	Market share (%)	Per household surplus			Cost
			Consumer	Producer	Total	
Family	$5.65	51	$1.43	$2.16	$3.59	$1.38
General Interest	$7.62	75	$2.19	$4.07	$6.26	$2.21
Movie	$1.72	44	$0.42	$0.58	$1.00	$0.38
Music & Entertainment	$2.55	48	$0.68	$0.93	$1.61	$0.62
News & Public Affairs	$5.10	43	$1.47	$1.66	$3.13	$1.20
Other	$1.03	34	$0.23	$0.29	$0.52	$0.19
Science & Nature	$1.71	50	$0.45	$0.65	$1.10	$0.42
Shopping	$0.38	14	$0.04	$0.05	$0.09	$0.03
Spanish	$0.77	26	$0.13	$0.17	$0.30	$0.11
Specialty	$2.42	54	$0.64	$0.98	$1.62	$0.62
Sports	$16.28	46	$4.15	$5.76	$9.91	$3.77

3.1.4. Scenario 2: Theme Tiers

What of theme tiers? Our results show that these provide intermediate benefits. Assuming marginal costs are the same here as under the full bundle, prices ranged from a high of $16.28 for the Sports Tier (containing ESPN, ESPN2, Fox Sports Net, the Golf Channel, and the Outdoor Life Network) to a low of $0.38 for the Shopping Tier (containing QVC, ShopNBC, and the Home Shopping Network 2). The average price per tier (network) is $4.11 ($0.90) and the average (tier) market share is 44.1%. Table 4 lists market outcomes for each of the theme tiers. If a consumers were to buy all the channels previously offered in the bundle, the total price would be $50.22 (including the $5 for "Limited Basic"), only slightly more than the bundled price.

What are the welfare consequences in this case? Assuming each of the networks offered in Monterey continues to be offered, the third column of Table 1 shows that consumers are now moderately better off and firms are moderately worse off. Average per-household consumers surplus under theme tiers is $11.84 (a 14.2% increase), gross firm profit is $17.29 (a 15.7% decrease), and gross total surplus is $29.13 (a 5.7% decrease). As before, consumers benefit by less than firms lose, yielding a decrease in total surplus.

As for full à la carte, adding networks to the full bundle produces more profit than adding them to theme tiers (by $6.48 or 37.5% of theme tier profits). Again ranking networks by their à la carte profit now shows 24 of the 50 offered cable networks would have to exit for consumers surplus under theme tiers to be no higher than in a bundled world.[44] Here, too, it seems unlikely so many networks would no longer be viable, suggesting consumer welfare would still be higher under theme tiers than the full bundle.

3.2. Robustness

In this subsection we consider the robustness of our results to several of our assumptions.

[44] The last four networks that would have to be dropped to equate welfare in this case are estimated to be Court TV, Outdoor Life Network, VH1, and Bravo.

3.2.1. Marginal costs

Our assumptions on marginal costs are both qualitatively and quantitatively important to our results. If, for example, marginal costs to cable systems were to increase by a factor of three when all networks are offered à la carte, both consumers surplus and the monopolist's profit would fall, decreasing total surplus by almost a third!

How likely is this scenario? Probably not very. Among all the assumptions on costs we've tried, 50% revenue sharing yielded the greatest aggregate gross profit to cable networks and cable systems next to the bundle. While detailed conclusions therefore depend on the likely form of contracts between network providers and cable systems in any à la carte scenario, some hybrid of low marginal costs and some bundling (like our Theme Tiers) or high marginal costs/revenue sharing (like our Full À La Carte) seems likely.

3.2.2. Correlation

In Section 2, we emphasized how important correlation can be for the profit and welfare consequences of bundling. In our baseline results, however, we assume independence in tastes for networks. In part, this is of necessity: there are over 1200 correlations between pairs of 50 networks and there are no empirical results to guide the choice of their values (or even their signs in some cases). As a very crude robustness test, we re-estimated our model assigning what we felt were plausible values for correlations both within and between the networks according to their allocation to our theme tiers and the results were nearly identical to the baseline specification presented above.

Does that mean correlation is unimportant? No. As noted in Section 2, bundling profitability is increasing in the negative correlation between a new product and an existing bundle, giving a monopolist strong incentives to carry such networks. This increased profitability also gives the monopolist incentives *not* to carry networks that are similar to other networks already included in the bundle (i.e. those for which correlation is likely to be positive). This factor has, if anything, the opposite effect for à la carte sales; carrying a competing network could enhance a cable system's bargaining power with incumbent networks. Bundling is therefore likely to bias cable systems against carrying networks that compete with established incumbent networks. Indeed, this conjecture can possibly explain consumers increased frustration about having to pay large annual price increases for cable bundles when the incremental additions to the bundle are highly-specialized niche networks (Squeo and Flint, 2004). If such networks help attract new subscribers but provide little value to existing subscribers, they are likely to be negatively correlated with tastes for the existing bundle. If marginal costs to cable systems for these networks are also above mean tastes – a possibility if only a small portion of the population values the new networks – the addition of these networks may be profitable but welfare-reducing.[45] Evaluating correlation in household tastes for networks are therefore an important area of future research.

4. Conclusions

In this paper, we conduct a numerical analysis of bundling's impact on a monopolist's pricing and product choice and assess the implications for consumer welfare in cable

[45] Even without correlation, we estimate the incremental consumers surplus from bundling to be positive for only 7 of Monterey's 50 networks and the incremental total surplus to be positive for only 28.

television markets. Since theoretical models are ambiguous about the net impact of bundling on welfare, we take a numerical approach. We calibrate a model of the pricing decisions of an average monopoly cable system and assess the implications of the model for consumer welfare in cable television markets.

We have three main findings. First, because bundling aggregates household tastes for bundle components (here cable networks), it can increase firm profits and reduce consumer surplus when marginal costs are low relative to mean tastes and when preferences are not too heterogeneous. Both of these outcomes are likely to be true in cable markets. Second, across a wide range of specifications, we find that bundling increases the profits of cable systems relative to à la carte sales, providing stronger incentives for cable systems to offer networks. Finally, and most important, our simulation results suggest the first effect is stronger than the second. In particular, in a "Full À La Carte" world, if all networks continue to be offered, average per-household consumers surplus is estimated to increase by $6.80 (a 65.6% increase), gross firm profit is estimated to fall by $9.08 (a 44.2% decrease), and gross total surplus is estimated to fall by $2.28 (a 7.4% decrease). These effects almost surely outweigh any compensating benefit of à la carte to enhance incentives to offer networks; we estimate that 41 of the 50 offered cable networks in Monterey would have to exit for consumers surplus under Full À La Carte to be no higher than that under bundling. Theme tiers offer similar, though smaller, effects (a 14.2% increase in consumers surplus, a 15.7% decrease in profit, a 5.7% decrease in total surplus, and 24 networks needed to exit to equate consumer benefits). On balance, we find that consumers might well benefit from à la carte sales of cable networks.

These conclusions come with important caveats. They depend critically on the nature of fixed and marginal costs to cable systems in an à la carte world, conditions we speculate on but cannot know. Furthermore, we don't directly model the consequences of competition between cable and satellite systems, nor the impact to the advertising market of à la carte offerings. The latter in particular could tip the scales in favor of bundling. Even more important, however, is that we have shown that many things *can* happen under bundling. To know what *will* happen requires better information, particularly about consumer preferences for individual television networks, cable systems' costs under both à la carte and bundled sales, and the link between household and advertising markets. These are all fruitful topics for further research.

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