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Bundles of Joy: The Ubiquity and Efficiency of Bundles in New Technology Markets

by

Stan J. Liebowitz and Stephen E. Margolis*

Executive Summary

This paper examines the economic logic underlying bundles and tie-in sales and uses the lessons learned from that examination to analyze seven specific instances of bundling that have been the subject of antitrust scrutiny or other policy initiatives. It is particularly interested in products that are non-rivalrous in consumption, making all-you-can-eat pricing a viable candidate for efficiency. The main economic points are the following: A la carte pricing may populate economic models, but most products are bundles. They are bundles because bundles are generally more efficient. Tie-in sales are much less common and often not properly understood in textbook discussions. Market foreclosure, the principal efficiency concern with tying and bundling, is likely to be exceedingly rare. The seven instances of bundling (ties) examined in the paper are: cable television; patent pools; blanket licenses; iPods and iTunes; telephones; music albums and songs; and operating systems and component programs.

* Stan Liebowitz is Ashbel Smith Professor of Economics at the University of Texas at Dallas. Stephen Margolis is Professor of Economics at the North Carolina State University College of Management. This paper is offered by Professors Liebowitz and Margolis as part of the "Perspectives from FSF Scholars" series. The authors would like to acknowledge helpful comments from the participants at Searle Center Roundtable on the Law and Economics of Innovation at Northwestern University and the George Mason University Law School/Microsoft Annual Conference on Regulation of Innovation.

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Table of Contents

I. Introduction	3
II. The General Framework	5
III. Theories of Bundling and Tie-Ins	9
A. A Theory, of Sorts, of Pervasive Bundling.....	9
B. Some Theories of Bundling and Ties Other Than Humdrum Efficiency. ..	11
1. Market Foreclosure.....	12
2. Metering: Price Discrimination or Risk Shifting.....	15
3. Surplus Extraction (Stigler, Bakos and Brynjolfsson).....	17
C. Public Goods Problems.....	19
IV. Seven Suspect Bundles.....	21
V. Special Applications to Innovation and Information Markets.....	22
A. Patent Pools	22
B. Blanket Licenses	25
C. Music: MP3s, CDs and DRM.....	27
D. Tying iPods to iTunes	31
E. Cable Television.....	32
F. Telephone	35
G. Software	37
H. Unbundling as Market Foreclosure.....	40
VI. Hope for Bundling Policy?	42
VII. Conclusion.....	46

I. Introduction

Bundling and tie-in sales are well-worked topics in both economics and law. Economists have largely answered, in the negative, the question of whether tying the purchase of a monopolized good to some other good readily provides the monopolist with rents from a second monopoly. Although a tie-in can create a new monopoly, it can do so only under extremely limited circumstances. Beyond that, economists have hatched some clever theories that explain why firms might nevertheless engage in tie-in sales. Most of these explanations find that tie-ins can be socially harmless, harmful, or beneficial, but nevertheless not monopolizing. Economists have also turned their attention to bundling. Most of these examinations try to explain conditions whereby bundles might increase profits. In some recent considerations of bundling and tying, the distinction between them appears to be blurring.

In law, tie-in sales were made illegal under section three of the Clayton Act in instances where they would tend to create monopoly. Since then, doctrines developed in case law now extend the provisions of the Sherman Act to tie-in sales, expanding awards and easing the burden of proof by making tie-in sales a per se violation of the law once certain threshold conditions are met.¹ Tie-ins and bundles have also long been addressed by patent abuse doctrines, and most recently they are under attack in telecommunications regulation.

Much of the economics literature on tie-ins and bundling is predicated on the assumption of either simple monopoly or a dominant firm. Market foreclosure theories, which are the basis for what limited economic support there is for a rule against tie-in sales, require that the dominant firm's sales of tied goods could capture a very large share of its industry. We will have more to say on this later.

Lately though, some economists have called attention to the important fact that a great deal of actual tying takes place in industries in which there appears to be considerable competition.² In fact, a great majority of bundling instances can be found in markets that either are an adequate approximation of the economist's theoretical model of competition, or that exhibit the sort of rivalry that common usage and common sense would call competition, even if some economists wouldn't. The fact that bundling occurs in competitive markets is evidence that the practice has efficiency explanations, for otherwise it would be competed away. In turn, if bundling is efficient when practiced in highly competitive markets, it may well have similar properties when practiced by a monopolist. Finally, although it may well be efficient, bundling always restricts choice to some extent and therefore consumers interested in that choice may express frustration

¹ *Jefferson Parrish Hospital District v. Hyde*, 466 U.S. 2 (1984)

² For example see Kobayashi 2006, Hazlett 2006, Evans and Salinger 2005. All sources and authorities are listed with full citations on the References page at the end of the paper.

and unhappiness with a welfare enhancing arrangement that is nevertheless not ideal. In this case the ideal is the enemy of the efficient.

This paper considers the economics and law of tie-in sales with particular attention to innovation. Markets affected by innovation will involve invention, creative works, other new goods, and new ways of producing or delivering goods. Typically these are markets in intellectual property, or markets that are fundamentally affected by intellectual property. Many of the contemporary controversies over bundling and tie-ins involve these markets and many innovation markets seem to collide with a regulatory disposition that is antagonistic to bundling. While regulators' antagonism to bundling is widely noted, we will also observe that in important cases, regulators or would-be regulators proposing to 'unbundle' have actually been hostile to full unbundling, although the nature of the bundling is often hidden in these cases. We will return to that below.

The paper offers support for three general claims. First, bundling not only occurs under some competitive conditions, but it is pervasive in the economy and is the dominant form of sales, for reasons that have to do with efficiencies of a simple and obvious nature: most goods are bundles. Second, the conditions required for tying or bundling to create monopoly power for reasons other than product improvement are very restrictive, so restrictive in fact, that such episodes are likely to be a vanishingly small fraction of all tie-ins or bundles. Of course, most bundles do have the potential to foreclose sales by others in a simple and obvious way. Houses with kitchens, by way of example, will reduce the demand for restaurants. But most bundling has nothing to do with monopoly power in any sense. Third, in light of the first two, tying and bundling should not be per se illegal in antitrust law; instead, all cases should require a demonstration of a high likelihood of actual exclusion and the absence of an efficiency defense. Equivalently, telecommunications policies that implement mandatory unbundling should be reconsidered or abandoned.

We begin by offering some clarifications of current terminology and a general discussion of tying and bundling. We focus on some variations of bundling practices (e.g., all-you-can-eat buffets versus a-la-carte pricing) that describe actual market sales that do not fit neatly into either tying or bundling. After that, we review some of the competing explanations of bundling and tie-ins, with particular attention to markets in intellectual property. We follow that with a list of new-technology bundling-related practices that currently encounter regulatory scrutiny and then provide a more detailed case-by-case discussion of these markets. We examine actual bundling practices to see how they relate to the proffered explanations, how they are regulated, and what problems they may address. Finally, we consider briefly the legal treatment of tie in sales, noting recent progress, in the antitrust world at least, away from a per se doctrine against bundling and tie-ins.

II. The General Framework

The terminology in this literature has been, in our opinion, getting muddled. We will use “tying” or “tie-in sale” throughout to refer to any arrangement in which a buyer’s access to one good (the tying good) is conditioned on his consenting to purchase a variable amount of one or more other (tied) goods from the seller. Typically, this takes the form of an “all requirements” clause, by which the buyer of a tying good agrees to satisfy all requirements for some other good through purchases from the seller of the tying good. We will also refer to virtual ties when firms try to reach this type of arrangement without actual contracts, for example, a firm selling ink jet printers that work only with its own proprietary ink cartridges. We will use the term “bundling” to represent instances where fixed quantities of items are sold together. Pure bundling refers to the circumstance in which goods are only sold in bundles and mixed bundling occurs when a seller offers both bundles and stand-alone versions of one or both of the individual goods. The bundles can contain differentiated goods or undifferentiated goods.

We will take up some space here to elaborate on this terminology because there is a risk that useful distinctions will become lost, and our vocabulary less useful, much as the term *public good* has become muddled, with numerous and inconsistent definitions in circulation.³ Tie-in sales have a history going back to shoe machinery being tied to supplies and other shoe machines, IBM calculating machines being tied to Hollerith cards, and canning machines being tied to tin-plate. The key feature of tie-ins is a contract based on a promise to purchase the secondary good from the seller of the primary product. This leads to a *variable* relationship between the quantities of the two goods.

Bundles, on the other hand, are just what the name implies—*fixed* amounts of multiple units or multiple products. The interest within the profession has been with bundles containing differentiated or different products due to the antitrust issues involved. Stigler’s 1963 example of bundles of different movies being sold to theaters was an example of bundling differentiated items. Buying a container of a dozen eggs, on the other hand, is a bundle of undifferentiated products. More famously, Microsoft’s provision of Internet Explorer and more recently Windows Media Player in the Windows Operating system is a bundle, at least in the sense that we are using here.⁴

Only where goods are used in fixed proportions (and if all the units contained in a single bundle are consumed) are ties and bundles the same. Thus Microsoft’s practice of including browsers or media players is not a tie-in because

³ It appears as if some writers are beginning to equate pure bundling with tie-in sales, which seems incorrect to us. Hahn states on page 2 that “so called pure bundling is equivalent to tying.” Evans states on page 68 that “pure bundling necessarily involves a tie.”

⁴ In what follows, we will elaborate on the idea that most goods are bundles, bundles of attributes and components. Thus, we offer no suggestion here that these bundles meet a legal standard of constituting two or more separate goods.

customers do often use more than one of these products with the operating system—one from Microsoft and one or more from other providers. Thus the practice imposes nothing like an “all requirements” constraint.

But there are other combinations of products that are neither ties nor standard bundles. Go into an all-you-can-eat buffet restaurant and what you are offered is neither a tie nor a fixed bundle. The food items are consumed in variable proportions, but there no tie in the normal sense. You are given access to an unlimited bundle of goods (from the point of view of an ordinary consumer), and what is consumed varies for each consumer. The price you pay is an entrance fee and is not a function of use—customers can eat as much or as little as they want. We refer to this as *all-you-can-eat* pricing. Cable TV, which provides only ‘packages’ of numerous channels, is an example of this type of pricing as opposed to a traditional bundle. No individual can watch all the programs on all the channels but they can watch as much as they wish of any channel in the bundle for one flat fee (per month).

Finally, the antithesis of a bundle is complete a-la-carte pricing. This is a case whereby consumers pay for the exact amount of each item that they consume. Paying for every penny’s worth of gasoline, every portion of a kilowatt hour of electricity, and every hundredth of a pound of filet mignon represents a-la-carte pricing. Bundling, by its nature, is incompatible with a-la-carte pricing. There is nothing about tie-in sales, however, that precludes a-la-carte pricing.

Economists generally think about an a-la-carte world—our models of markets are of the a-la-carte variety.⁵ In the idealized markets that we use to illustrate supply and demand, there is a perfectly homogeneous good sold in units we can define as narrowly as we wish. Consumers can purchase any number of units at a fixed price per unit. Transaction costs are swept under the rug so there is no cost differential in purchasing ten individual units all at once or five purchases of two units each.

Efficiency arguments fit easily into this a-la-carte world. Goods are produced at a positive marginal cost, and in competitive markets consumers will chose, on their own, to purchase only those units for which their reservation price exceeds that marginal cost, no more, no less. Any more, or any less, would be inefficient. A-la-carte sales provide the right incentives to consumers and no unnecessary constraints. We don’t observe left-over amounts since no one orders any more than they want, or for that matter, any or less.

A-la-carte also appears to provide maximum consumer sovereignty. Consumers purchase the exact amounts of goods that they want. When we pump gas the amount we pay is directly related to the amount we purchase, measured to the last penny. This corresponds directly to our a-la-carte models. We do not purchase more gasoline than we want, nor do we purchase less. We purchase just the right amount. For goods that are not easily divisible, we could achieve similar

⁵ Recent discussions of the restrictions of a-la-carte include Liebowitz 2005 and Hazlett 2006.

results by renting the good instead of selling it (although robust resale markets might help to achieve the same goal).

But most markets do not function in this a-la-carte manner. As we will see, however, deviations from this ideal do not imply inefficiency but instead merely that some costs are left out of our convenient textbook models.

For example, when you go to a restaurant, you might order rice as a part of your meal. You do not specify the numbers of kernels of rice that you wish to have put on your plate. Nor does McDonald's sell individual French fries. Food is almost always sold in bundles. So is almost everything else. Unless you go to stores with unpackaged ingredients sold by weight, you buy packages: paint, tape, nails, golf balls and blank CDs, for example. Automobiles are not usually sold by the miles traveled, nor are homes sold by the hours used, although there are rental markets for each.

The reason for these bundles is simple. Although these physical packages may be too big or too small compared to the ideal for each consumer, the costs of having someone to measure out an amount exactly equal to the customers' wishes are greater than the potential welfare losses from packages that are not the ideal size for each individual consumer. The time cost of counting or measuring the kernels of corn, and the cost of pricing such variable amounts would be greater than the benefits from perfect consumption levels. Otherwise vendors who provided exact measurements would have survived and packaged goods would not have come to dominate the markets. In the case of food, there is also a sanitary benefit to packaging it at the factory.

For similar reasons, complex items like refrigerators, which contain numerous parts, come prepackaged and not sold as separate components. A few tinkerers who enjoy building refrigerators might benefit from being able to pick and choose parts, but the rest of us prefer to have the package assembled at the factory. The cost savings are very large in having a factory assemble the good as opposed to individual craftsmen. Think Henry Ford here. Customization is an alternative to standard bundles but a very expensive one. Information costs play a role here too—refrigerators are not often rented because the costs of tracking usage and misuse are too high relative to whatever small benefits might occur from the 'ideal' a-la-carte type of metering.

Although the reason for these bundles is fairly obvious, we will get some non-ideal consumption with bundles compared to an idealized a-la-carte world. But we all know that the benefits of such bundles, in the real world, outweigh the costs and thus we lose no sleep over a theoretical loss from these types of bundles which are so commonplace that it is almost impossible to think of any manufactured consumer product that is not a bundle of components.

Services are usually bundles as well. When you get your hair cut you not only use the services of the haircutters, but also the tools used to cut your hair, the mirrors, the shop they work in, the floor cleaning equipment, and so forth.

The consumer could provide these additional materials and merely hire the haircutter, but it is much more convenient to hire the bundle. The same is true of doctors, dentists, plumbers and most any other services.

Although bundles violate the a-la-carte ideal, the true opposite of a-la-carte is “all-you-can-eat.” In all-you-can-eat markets consumers pay an entrance fee which allows them to consume as much as they want of the product or products being sold. This more completely severs the link between the quantities consumed and price paid than does bundling, which can still provide a fairly close linkage if bundles contain relatively small quantities of a few items normally consumed together. All-you-can-eat brings up different problems from normal bundling.⁶ If the product being consumed has a positive marginal cost, an all-you-can-eat price appears to be inefficient since consumers will over-consume the product in question. All-you-can-eat always pushes consumers to the point where marginal value equals zero, which is always too much, unless the marginal costs are zero. Nevertheless, all-you-can-eat can make sense when there are high costs in measuring usage, where tastes, or capacities to consume are not too different, or where marginal cost is low.⁷ If all-you-can-eat offers were notable in concentrated markets the way they exist in atomistic markets like restaurants, we suspect there would be many economic models describing the inefficiencies of such a scheme and many policy prescriptions to prevent such behavior.

It is possible to have both bundles and tie-in sales of a single (undifferentiated) good although there is no possibility of monopolizing a second market when bundles involve just a single good. When eggs are sold in packs of six or twelve, that is a bundle. When a book publisher sells his publishing services to an author and puts a right of first refusal into the contract, that is a tie-in sale of early publishing services with later publishing services. Consumers may be unhappy when they go to Costco and find a colossal 128 ounce jar of peanut butter at an attractive price, but they generally don't believe that the seller is trying to monopolize their consumption of peanut butter for the rest of their lives.

How do bundles differ when the items in the bundle are actually different products sold in different markets? When McDonald's sells a hamburger *and* french fries *and* a toy together in a happy meal, it has created a bundle made of separate products. McDonald's practices mixed bundling, however, meaning that you can also buy the food items separately. No one seems to object to the bundle (except for some nanny-wannabes who object to any combination of food sold by McDonald's).

Your ordinary restaurant, however, is not likely to be so accommodating. There you may order a dish that comes with a vegetable, a starch, and a salad. Although some restaurants have been known to allow users to mix onion rings with french fries, you most often will not be allowed to put a plate together from

⁶ We are only aware of one paper that examines all-you-can-eat buffets, Ostaszewski and Sahoo 1999.

⁷ For the classic elaboration of two part tariffs, where the price per unit is not set to zero, see Walter Oi 1971.

various sides unless you offer extra money on the side. Sometimes you may not be allowed any mixing and matching of various dishes, as the Jack Nicholson character found out in the famous diner scene from the movie *Five Easy Pieces*. As the Nicholson character demonstrated, however, bundling can make consumers angry about the loss of choice that would otherwise be available in a-la-carte. Fortunately he did not go to the antitrust authorities to for help, but instead proposed a novel form of unbundling in order to obtain a plain omelet with wheat toast. Unfortunately, the transactions costs turned out to be prohibitive.

III. Theories of Bundling and Tie-Ins

A. *A Theory, of Sorts, of Pervasive Bundling*

As should be clear from our earlier discussion, bundling is so common that its main purpose should be abundantly clear. Very simply, lots of things are bundled, and bundles often include lots of components because there are enormous efficiencies in bundling. Efficiencies commonly arise on the production side, where building and shipping a multifunction device may be cheaper than building and shipping several single-function devices. Think combined radios and CD players and multifunction pocket knives. The economies can also originate on the consumer side—kits for making a cake or repairing a toilet.

The automobile often serves as an illustration of bundling that occurs in competitive markets. Several writers in the bundling literature have noted that standard equipment for automobiles has changed over time. Heaters, air conditioners, rust proofing and sound systems, which once were optional, have become standard equipment. Each of these once supported an active aftermarket.

In fact, in the early days of the automobile, the manufacturer whose name was on the car often supplied only the chassis, drivetrain and instrument panel, which were typically sent off as a unit to a coachworks for the addition of the car body itself. There clearly were viable markets for chasses without bodies and for bodies without chasses, so that by today's *Jefferson Parrish* standard, a basic car consisted of two separate goods, a running chassis and a body. An automobile manufacturer that supplied both would have been engaging in bundling.

So, while the automobile example seems almost trivial, even silly—of course people want to buy a complete automobile—it does present one important lesson with regard to innovation: What passes for two goods at one moment in time may be understood to be a single good not many years later. As automobiles became more common—utilitarian devices instead of luxury items that were affordable only to the very rich—integrated packages of what were once understood as distinct goods became the norm. Series production and integration came with mass production to make automobiles available to the masses.

The automobile example also usefully illustrates the importance of economies of coordinating multiple components and of marketing, shipping, and assembling many disparate components in a single package. Heaters and air conditioners have become standard equipment on most cars because there are economies in engineering a car with all those things included and integrating them into the automobile itself. Tires and wheels are sold with a car, in spite of an active aftermarket, because most people want them that way and because it is awkward to deliver cars without them.

To illustrate this further we propose an economic experiment, one you can do at home. It's actually more of a demonstration than an experiment, but it's one of those learning by doing exercises that are thought to help solidify knowledge. Here it is. When you go home today, go out in your garage and disassemble your car. [Hint: Start off by removing the hood. Loosen the hinge bolts on one side, then get a friend to hold that side while you loosen the bolts on the other side. You probably will need to disconnect some wiring and possibly some windshield washer hoses before you start unbolting things.) Now find a place to put the hood down so that it rests on something soft, otherwise you will chip it or scratch it. Removing the trunk lid is a good thing to do next. Use the same technique, and again be careful where you put it down. Next unbolt all the doors and find a place for them. With the doors out of the way, it will be pretty easy to take out the seats. Careful though, there's often a lot of wiring to the seats that you will need to disconnect before you try to lift the seats out. All that stuff comes off pretty quickly and you will have a good sense that you are making progress. The rest of the process, as they say, is left to the reader. And as they say in the repair manuals, to assemble, reverse the disassembly.]

This demonstration teaches two lessons. The first is simply that there's more to a car than parts. Assembly is costly, difficult, and takes specialized knowledge and tools. The second will occur to you about the time you were removing the seats: An automobile is an efficient way to package, protect, store and ship car parts.

It is sometimes observed that the sum of the prices of all the parts in a car is a fairly large multiple of the price of an entire car. The observation is sometimes offered to show monopoly power in the parts market. But for many kinds of parts, there is a competitive aftermarket. And the prices of those parts, while less expensive than "factory" parts, also seems to be quite high, relative to their "share" of the automobile itself. A nicely equipped Honda Accord sells for something under seven dollars a pound. But there are few individual parts for a Honda that could be purchased, even in the competitive aftermarket, for seven dollars a pound. Figure three times that for a fender, delivered. Many components will have per pound prices much higher than that. Much of that cost differential has to do with the high costs of maintaining inventories of thousands of separate items, arranging supply channels, packaging and shipping individual items, and handling the transactions. Bundling often provides important economies regarding these costs.

No sensible person would expect that car parts should be priced as the price per pound of the car multiplied by the weight of the part. But otherwise sensible people seem to believe that such a comparison is useful in non-automobile markets, which we will see when we discuss some examples of regulatory unbundling.

B. Some Theories of Bundling and Ties Other Than Humdrum Efficiency

Tie-ins are less common than bundling and their purpose is less obvious. Thus it is understandable that economists and courts would try to determine their purpose. At the same time, bundles have also come under regulatory scrutiny and consequently have prompted economists to develop theories, other than the sort of commonplace efficiency discussed above, to explain them. The theories of tie-in sales and bundling that follow all have some currency among economists; they are regarded as being plausible explanations of why a seller would ever tie or bundle two or more goods together. That is not to say that there is agreement about the empirical relevance or applicability of these explanations.⁸

Before getting started, we take note of one theory of tie-in sales that is no longer accepted by economists, what is now commonly called leverage. A simple explanation of tie-in sales, too simple it turns out, is as follows. A monopolist in good A would, of course, charge a monopoly price for good A. In addition, if he chose to, he could compel his customers to purchase a second good that is otherwise available competitively. The monopolist would charge his customers a monopoly price on that good as well. The tie-in, therefore, would give the monopolist a second monopoly in good B, and two monopolies are better than one. It is now widely understood that two monopolies are not necessarily better than one when the second monopoly is imposed as a cost of using the first monopoly product. Elevated price on the tied product reduces consumer's willingness to pay for the tying product.

This is most easily understood in the fixed proportion case where elevation of the price of B above the competitive price has the same effect on sales of A as an increase in the price of A, so the full benefit of the monopoly can be attained through the standard monopoly pricing of A without the complication of a tie-in contract. If the second market is competitive, then life is easy for the good-A monopolist, who makes maximum profits just by charging the monopoly markup for A. It has long been understood, however, that if the market for some complementary good B is not competitive, then the monopolist in A will either have to collaborate with producers of B, as the joint profits of the two goods will not be maximized where the producers of both goods each charge ordinary monopoly prices, or else earn less than half of the full monopoly profits. Where

⁸ For a comprehensive review of bundling theories as well as a brief examination of the also brief empirical literature on bundling, see Kobayashi 2005.

two goods are used in variable proportions, there can be advantages to tying, but these advantages do not amount to extracting two monopoly rents from the monopolist's original customers. The rest of this section elaborates on these possibilities.

1. Market Foreclosure

Market foreclosure is essentially the last man standing as an economic defense of antitrust provisions against tie-in sales. Some of the other explanations of tie-ins presented below involve monopoly power, some show that tie-ins can increase total surplus from the tied products, and some allow a seller to capture more of the consumer surplus than he otherwise would, but none of them can be said to create new monopoly or to have clear negative welfare implications. There is a logical parallel to these economic findings in antitrust law, as recent key cases regarding tie-in sales have emphasized market foreclosure as the basis for condemning tying arrangements.⁹

The market foreclosure theory as presented in Whinston,¹⁰ involves a firm that is a monopolist in good A also requiring its customers to purchase good B as a condition of purchasing good A. By tying B to A, the monopolist crowds out potential rivals in the market for B.¹¹ Production of B is assumed, in this model, to be subject to increasing returns to scale such that a firm producing B can survive only if it acquires a substantial share of the B market. For example, suppose the minimum efficient scale for a producer of B was twenty-five percent of the B market (below this level the average production cost is greater than the efficient-scale monopoly price). If users of good A constitute more than seventy-five percent of the market for B, then a tie of B to A will foreclose the B market to any competitor, yielding a new monopoly to the good-A monopolist. Of course, just raising the price of B charged to the monopolist's A customers will not do the monopolist a lot of good, since he is already extracting the monopoly rent from them and if he attempts to extract more than that, some of his customers will abandon him for the potential entrant in B, who then enters. Elevating the price of good B will only lower the price that the monopolist can extract from selling A. But the good-A monopolist now can extract rents from a new group of customers. He now has the opportunity to extract monopoly rents from B-only customers, an opportunity that he wouldn't have without the tie. Note also that the good-A monopolist, now also a good-B monopolist, derives a benefit from the tie-in even

⁹ For example see *Jefferson Parrish Hospital District v. Hyde*, 466 U.S. at 16. "Of course, as a threshold matter there must be a substantial potential for impact on competition in order to justify per se condemnation. If only a single purchaser were "forced" with respect to the purchase of a tied item, the resultant impact on competition would not be sufficient to warrant the concern of antitrust law. It is for this reason that we have refused to condemn tying arrangements unless a substantial volume of commerce is foreclosed thereby" This "not-insubstantial commerce" requirement appears in both *International Salt* and *Northern Pacific*.

¹⁰ Whinston 1990 presents the market foreclosure theory; however the explanations for the tie-in in that paper are not confined to the market foreclosure argument.

¹¹ Since the model assumes consumers buy a maximum of one unit of each good, the tie-in is identical to a bundle for consumers of A who also consume B.

if his good-A customers use goods A and B in fixed proportions. (In fact, Whinston assumes fixed proportions,)

This model of tie-in sales is one more model of the “it-could-happen-that” variety. The model does describe a feasible case and it is internally consistent. The problem is that it has very limited applicability. We have elsewhere referred to this as a Goldilocks theory of tie-in sales.¹² Everything has to be just right for the model to provide a reason for tying. Users of good A must constitute a large enough share of the market for good B that other potential suppliers of B are crowded out by a tie-in. But if A’s customers are too large a share of the B market, there won’t be enough B-only customers to make the tie-in worthwhile. If the minimum efficient scale for B is not large enough then the good-A monopolist will have difficulty crowding out rivals in the B market. Further, the average cost curve must be steep enough that entry at output levels below the minimum efficient scale is deterred even as prices for B increase. Also, if the increasing returns to scale are great enough in market B, it might have been monopolized to begin with so that consumers would not be harmed by the switch in monopoly ownership that could result from the tie-in. So the problem with this theory isn’t that the circumstance that it describes couldn’t happen, but rather that it is unlikely to occur in many instances and thus seems unlikely to be able to explain very many cases of actual tie-in sales.

Whinston’s paper, along with several others that appeared in the early nineties, are heralded as the beginning of a new “post-Chicago antitrust economics.” This new school of thought was understood as providing formal models that rehabilitated theories of predation or coercion that had been dismissed by the Chicago School. Among these dismissed theories was the naïve leverage model of tie-ins presented in the first paragraph of this section. In the 1990 paper, Whinston quotes Posner (1976) as an example of this line of Chicago critics:

[A fatal] weakness of the leverage theory is its inability to explain *why* a firm with a monopoly of one product would want to monopolize complementary products as well. It may seem obvious..., but since the products are by hypothesis used in conjunction with one another..., it is not obvious at all. If the price of the tied product is higher than the purchaser would have to pay on the open market, the difference will represent an increase in the price of the final product or service to him, and he will demand less of it, and will therefore buy less of the tying product. (amendments are as they appear in Whinston)

Whinston goes on to fault the analysis that Posner is recounting for its “[P]ervasive (and sometimes implicit) assumption that the tied good market has a competitive, constant-returns-to scale structure. With this assumption, the use

¹² Liebowitz and Margolis, p. 251. For additional comments on market foreclosure theories, see Carlton and Waldman, p. 39.

of leverage to affect the market structure is actually impossible.” Accordingly, he introduces a framework that assumes increasing returns to scale in the tied good market and then explains the possibility of foreclosure in this increasing returns world. Whinston presents a consistent theory and explores it quite fully. It has rightfully influenced a great deal of economic theory.

The problem, however, with this as a foundation to the post-Chicago renaissance, is that the possibility of foreclosure was not overlooked in the Chicago analysis; rather it was explicitly recognized and excluded because it appeared to lack much empirical relevance. Tie-in contracts were observed to allow the seller to charge a price for the tied-good that was above the price *available elsewhere*. Competitors were not foreclosed from the market for the tied good. That was the phenomenon that presented a puzzle, and a two-monopoly explanation was unsatisfactory. In many cases the seller of the tying good purchased the tied-good from other producers and resold it at higher prices. IBM, for example, did this with Hollerith cards. IBM had no chance to monopolize the paper or cardboard market and made no attempt to do so.

In Posner’s paragraph immediately prior to the one that Whinston quotes, which we have represented above, Posner writes: "One striking deficiency in the traditional, ‘leverage’ theory of tie-ins, as the courts have applied it, is the failure to require any proof that a monopoly of the tied product is even a remotely plausible consequence of the tie-in."

He then cites the AB Dick case: “In the AB Dick Case, for example, the defendant had tied ink to its mimeograph machines. It is hardly credible that A.B. Dick was attempting to monopolize the ink industry; only a small fraction of the ink sold in this country is purchased for use in mimeograph machines." (p. 172)

This is not to say that Posner anticipated the particulars of Whinston's theory, but he clearly provides evidence that foreclosure was contemplated and dismissed as the explanation for observed tie-in sales. Later, after defending the importance of the price discrimination argument against certain criticisms, Posner writes:

Only in the rare case where the sale of the tied product for use with the tying product represents a substantial share of all sales of the tied product might preventing the independent producers of the tied product from selling it to the customers of the tying product substantially affect competition in the market for the tied product." (p. 175)

In quoting Posner on the weakness of leverage theory, Whinston does use appropriate markings to indicate that he has omitted some text. Nevertheless, Whinston has subtly changed Posner’s meaning. Whinston amends Posner’s statement so that it reads "[A fatal] weakness..." when what Posner actually writes is, "A second--and fatal--weakness..."

The first weakness, as quoted above, is that in the available cases, foreclosure is not even a remote possibility. What is obscured in Whinston's telling is that Chicago law and economics had not failed to consider exclusion. Clearly it had considered exclusion, or at least one of the Chicago practitioners had, but found it lacking in empirical importance. Posner favors the price discrimination argument not because he was unable to imagine the possibility of exclusion, but rather because the price discrimination hypothesis had empirical relevance and exclusion did not.

One final note on this. As seen above, sellers practicing tie-ins are often not the producers of the tied good. They often purchase the tied good to re-price it. In such circumstances, the exclusionary consequences that are the thrust of Whinston's model become even more remote, if not impossible. Such cases clearly should be distinguished from those in which the firm engaging in tying produces the tied good.

2. Metering: Price Discrimination or Risk Shifting

As noted above, we define tie-in sales to be any arrangement where a seller provides good A under the condition that the buyer make any purchases of some other good B from that seller. This arrangement allows for variable proportions. In the Chicago School tradition, tie-ins are usually explained as price discrimination or, far less frequently, as risk reduction. The price discrimination explanation, as it is often presented, is incomplete and, in our opinion, largely incorrect.

Textbook discussions of tie-in sales typically mention the basic price discrimination explanation, which goes something like this: The tied good is a metering device that measures the usage of the tying good. The number of Hollerith cards used, therefore, measured the use of the IBM calculation machine. The amount of toner used measured the use of Xerox machines. By using the tied good as a meter, the seller can identify the intense users. This information is used to charge intense users higher prices for the machine through a markup on the tied good. This pricing arrangement is profit maximizing because the intense users are likely to be the less elastic demanders of the associated machines (or to have the highest reservation prices). By raising the price of the tied good and lowering the price of the tying good, the more intense user effectively pays more for the machine than the less intense user. Q.E.D.

What are the problems with this explanation? For one thing, although we are told that price discrimination is occurring, the item whose price is being altered is not usually defined. By this we mean that the actual item being purchased is neither the tying good nor the tied good but the services jointly produced by the two. If a tie-in sale discriminates against intense users, then they are presumably paying more for these services than are less intense users.

However, the intense user does not, in fact, pay more for the joint services. If an intense user and a slack user each purchase a machine and the intense user generates N times as much service using N times as much of the tied good, the intense user will pay N times as much for the tied good but the same price for the tying good as the less intense user. Thus the intense user pays less than N times as much, in total, and yet receives N times as much service. No matter how much we raise the price of the tied good or lower the price of the tying good toward zero, the intense users always pays a lower price per unit of service. This is not a case of price discrimination against the intense user.

Further, this story is simplistic in its assumption that the intense user pays the same amount for the tying good as the less intense user. Eventually, the tying good will wear out and it will most likely wear out more rapidly the more intensely it is used. In fact, it is possible that because the intense user has N times the usage, that he will need to purchase N times as many machines as the slack user. If this were the case, then it is readily apparent that both parties would pay the same price for the services jointly produced by the tied products no matter by how much the prices of the tied and tying goods are altered. In this case the intense user always pays N times as much for N times the service, giving identical prices for the service to the two users.

Left out of the traditional metering story, therefore, are the nature of the product (service) being purchased, the relative prices paid for the service, the form of depreciation of the tying good, and the nature of the contract, i.e., whether the tying good is rented or sold. A fuller explanation of how these items interact can be found in Liebowitz (1983).

Neglected from most tie-in discussions is an alternative explanation of tie-in sales focusing on the possibility that the tie reduces customers' risks. Suppose potential customers for some tying good are risk averse, and the possible payoffs associated with the purchase of the tying good are positively correlated with the use of some associated good. The seller can reduce risk to these customers by lowering the price of the tying good and raising the price of the tied good. This will decrease dispersion of payoffs. More intuitively, it decreases the fraction of states-of-the-world where the purchase of the tying good turns out, ex post, to be a mistake. This is a particularly effective strategy if the key element of the consumer uncertainty is a random shock in the business of the customer-firm relative to the market in which the firm operates, a risk that can be predicted and internalized by a seller of the tied goods catering to the entire customer base, just as an insurance company can internalize many of the predictable individual risks facing a population.

For example, take the case of a calculating machine, used with Hollerith cards, that can be employed by accounting firms that are unsure that the purchase of the machine will be a profitable decision. If the firm has a good year relative to other accounting firms the machine will be worthwhile, but if it has a bad year the purchase of the machine will not be a good investment. Assume that

the typical firm has a positive expected value for the machine calculated over both states of the world, but that the risk of a bad year deters many from making the purchase. The seller of the machine, by instituting a tie, can lower the price of the machine, while raising the price of cards, and decrease the financial harm to those firms that have a bad year. Although the expected value of the machine may not change, the risk is now lower since the loss is less in the bad year (and the gain is less in the good year). Since the risk involved is internal to the industry, a seller of machines can take on the risks of the individual firms. In this situation both the seller of the accounting equipment and the purchasers are better off due to the insurance component of the tie. Although the same result can be achieved by selling the services a-la-carte (through a rental based on use), the transactions costs of doing so will often be prohibitive.

A key difference between these two explanations is that under the risk reduction hypothesis both the seller and the buyer are better off under the tie. The tie provides a valuable form of insurance. There are no antitrust or negative welfare concerns to deal with. The price discrimination hypothesis, by comparison, benefits the seller, harms buyers as a group, although not necessarily all buyers, and has unclear welfare effects.

3. Surplus Extraction (Stigler, Bakos and Brynjolfsson)

The previous section considered explanations of tie-in sales that relied on variable proportions. Different customers used different amounts of the tied good with a unit of the tying good. Here we consider explanations of bundling that rely on the producer being able to extract additional surplus from consumers. Typically, these bundles involve one of each of several, sometimes very many, distinct goods.

The basic idea for this explanation goes back to Stigler (1963), who sought to explain block booking of movies to television stations by movie distribution companies. Under block booking, television stations were being “forced” to take movies that had putatively little value, as a condition for getting access to desirable movies. On the face of it, the idea makes little sense. If the distribution companies could extract large payments for desirable movies, they were free to do that directly, they didn’t need to do in through forced sales of overpriced dogs. Stigler’s explanation relies on differences among consumers regarding their evaluations of the movies. It works as follows. Suppose there are two types of customers, say red and blue. Suppose the blue customers value movie A at 10 and movie B at 4. And suppose the red customers value movie A at 8 and movie B at 6. With simple pricing of each movie, revenue would be maximized with movie A renting for 8 and movie B renting for 4. Total revenue from a representative pair would be 24. However, red customers would be willing to pay 14 for a bundle of the two movies, and blue customers would also be willing to pay 14. The revenue maximizing price for the bundle would be 14, and the revenues from a representative pair would be 28.

In this example the bundling extracts more of the consumer surplus than individual-item pricing allows. The price for A alone leaves a blue customer with a consumer surplus of 2. The price of B alone leaves a red customer with a surplus of 2. But the bundle extracts all of the surplus from both customers. Intuitively, the variation in reservation prices is greater for individual movies than for the movie bundle. This means that pricing individual goods leaves some money on the table for each type of customer whereas bundle pricing leaves less surplus on the table. This sort of pricing is quite common, although the bundling is easily obscured by offering to sell each of the goods individually at the highest reservation price offered by either party, and offering the bundle as a discount. For example, using the values in the example, movie A could be offered at 10, movie B offered at 6, and the bundle offered at a discount of 2.01, or a price of 13.99.

Stigler's bundling story has been generalized and extended by several authors. Among those extensions, Bakos and Brynjolfsson's work, which specifically addresses pricing of information goods, extends the argument in several ways. They assume marginal cost of potential components of a bundle to be zero and they consider bundles with large numbers of components. Generally, Stigler-type bundling is more likely to be profitable where marginal cost is low relative to all consumer evaluations. Otherwise, the differences in valuation of any good between high value and low value consumers can easily be large enough that marginal revenues available from serving the low-value customers are less than cost. This issue was elided in the example above by speaking specifically of maximizing only revenues, implicitly assuming that the seller would sell each item to each customer. But that wouldn't necessarily occur. It would not, for example, if we had specified that marginal cost of providing each of the movies was 6.

As in the example above, Stigler's explanation of bundling requires that the buyer who would be the high bidder for one good will also be the low bidder for the other. Other writers have generalized Stigler's explanation for bundling to consider cases where bundling merely reduces the dispersion of reservation values.

Bakos and Brynjolfsson consider the bundling of large numbers of information goods where consumers demand one unit of a good or none, and the distributions of their reservation prices need only be bounded and independent. These distributions can have different means; one component can be worth more than another. But a consumer's departure from the mean of the distribution for any component does not predict that consumer's departure from the mean valuation on any other component. Bakos and Brynjolfsson also allow for the possibility that the valuation of any component in a bundle depends upon the number of goods in the bundle.

Under these assumptions, the law of large numbers assures that the variance of the average valuation of components in a bundle gets smaller as the

number or components in the bundle gets large. Equivalently, this implies that the variation of the total value of the bundle gets smaller in proportion to the total value, as the bundle gets large. In turn, for large bundles, the seller confronts demand that is very elastic around the median value of the bundle, and very inelastic away from the median values. For large bundles, sellers will find it profit maximizing to charge a price for the bundle just below the price at which reservation prices are concentrated. If reservation prices are highly concentrated, most potential consumers will buy the bundle. This will have a positive welfare impact for goods that have zero marginal cost, such as public (non-rivalrous) goods, a topic we take up in the next section.

While the setting for Bakos and Brynjolfsson's model is quite different from Stigler's, something similar is going on. In Bakos and Brynjolfsson's model, the consequence of large numbers of goods is that for an individual consumer, the money on the table that would be left for the goods they value relatively highly are offset by short money on the goods that they value less than the typical consumer.

It is fairly intuitive to see that this averaging out will break down if valuations are highly positively correlated, meaning that the consumer who places a relatively low value on one good also places a relatively low value on other goods. Such an assumption might make sense, for example, for consumer goods where valuations of the entire set of goods might be correlated with income. But two considerations bear on this. First, consumers may well face a common set of substitutes for the goods in a bundle, therefore limiting the correlation between valuation and income. Second, where bundles are provided in competitive markets consumers may face alternative sources for the very same goods.

C. Public Goods Problems

Bakos and Brynjolfsson build their model around information goods. Not only are information goods topical, but the zero marginal cost normally thought to describe information goods highlights both a challenge for private supply and a potential contribution of bundling. For public goods, or more specifically non-rival goods, the cost of serving an additional user is zero. In that circumstance, confronting a user with a positive price for using a non-rival good is inefficient. In particular, a-la-carte pricing is inefficient. The positive price will discourage some uses of the public good, which results in some potential surpluses going unrealized.

Bakos and Brynjolfsson's model offers an important result: If values of the individual elements of a bundle are uncorrelated, as the number of elements in a bundle gets large, the fraction of potential users that are priced into the market approaches one. So long as the individual's willingness to pay exceeds the necessary threshold, the marginal price of any element in the bundle is zero.

As understood from the Bakos and Brynjolfsson model, bundling offers an imperfect and partial solution to the non-rivalrous goods problem. Pricing of a bundle allows the seller to cover the cost of creating the non-rivalrous goods that make up the bundle, while confronting the buyer with zero marginal cost for any element of the bundle. It is imperfect, of course, because consumers are confronted with a positive price for the bundle, and some consumers will elect to forgo the bundle even though marginal cost of providing it (zero) is less than the consumer's willingness to pay.

There are two margins of under-consumption of non-rival goods that can be addressed by bundling. The first is whether people purchase a good at all. If bundling reduces variance in the average values of the components, this aspect of the underconsumption problem is diminished. The same is true if the bundle contains items that tend to be used together so that there would be few consumers wanting to purchase only a small portion of the bundle. The second margin concerns how much consumption of any given non-rivalrous product occurs within the bundle. If the products sold in the bundle are of the all-you-can-eat type then the problem with under consumption at this margin does not arise. And of course, for non-rival goods, there is no problem of over consumption.

A difficulty with bundling as opposed to a-la-carte is that it does not solve the standard problem of determining which goods to produce. A bundle seller is not confronted with data on consumers' willingness to pay for individual items in the bundle, only the willingness to pay for the whole thing. Of course, the seller of a bundle does at least confront consumers' willingness to pay for the entire bundle, which distinguishes a bundling seller from a government. And depending on the nature of sales, the seller may be able to note which elements of the bundle are being consumed in greater quantities than others (cable operators might know which channels are being watched just as a restaurant buffet operator will note which dishes require more frequent replenishment) which should provide some feedback to the production loop.

Also, the problem of identifying the value of individual bundle components is not absent from very common private goods bundles. Restaurants will experiment with portion size and ingredient combinations. Customers will reveal the values they place on various bundles, and although their behavior will reveal something about the quantity of demand for different components of the bundle, it does not reveal the values that they place on individual items. Critics of such bundles are correct that the information flow is imperfect, but except for pure a-la-carte markets, this criticism is true for most everything else and thus has little practical force.

Finally, markets in which bundled public goods are sold are not necessarily monopolies. Many, like cable companies, telephone providers, or music subscription services, face one or more rivals offering competing bundles made up of many of the same components. Some of these are intermediaries,

resellers of the public goods that are created by other entities. Consider iTunes, a partial a-la-carte model (partial in the sense that you do not pay each time you listen) where consumers purchase permanent rights to digital songs. iTunes, which sells songs and albums competes against Napster-to-go, Rhapsody and Yahoo, which all offer rental of a giant bundle of songs that expires when membership expires. In these cases, sellers can compete on the appropriateness of the bundles they offer and also may cater to different audiences. Either of these forms of rivalry provides an incentive for providers to tailor their offerings to consumer preferences.

IV. Seven Suspect Bundles

If Department of Justice officials can talk about the nine no-nos of licensing, we can have a section head called “seven suspect bundles.” Here are the seven.

1. *Patent Pools*: Patent pools or patent sharing agreements have also aroused patent abuse or antitrust concerns in the past. In some instances, particularly where the pools charge royalties, there has been an antitrust concern that the pool serves as a mechanism for cartelization. But the common all-or-nothing bundling of patents by these pools has raised separate objections.
2. *Blanket Licenses*: These licenses, issued by copyright cooperatives such as BMI and ASCAP, permit use of the entire catalogues of these cooperatives. Users have objected that they wished to carve out pieces of the blanket and pay for them directly, outside the blanket. Is it efficient to allow this type of carve-out?
3. *Music*: CDs, MP3s and DRM: Selling CDs, selling individual songs, or selling (renting) each second of music listening (micropayments) all become possible with new technology. Digital rights management (DRM), which should make such selling possible, has led to much gnashing of teeth by many legal scholars. Yet this form of selling is closest to a-la-carte. Ironically, the selling of CDs has often been termed by critics of the recording industry as forced bundling of unwanted songs.
4. *Tying iPod to iTunes*: Apple’s iTunes works only with Apple’s own MP3 players, and Apple’s MP3 players are directly compatible only with the iTunes service. The attempt by Apple to create a virtual tie-in has raised concerns, leading to demands for ‘interoperability’. Apple’s practices have not raised much concern on our side of the Atlantic, but the European Commission and the governments of several countries have objected. iTunes sells both albums and individual songs. Other models (Napster, Yahoo) also sell all-you-can-eat bundles of songs for a fixed price. Which model is more efficient? Which makes the most business sense?
5. *Cable Television*: Cable Television providers typically offer programming channels only in bundles, often called “tiers.” These bundles are all-you-can-eat. Kevin Martin, the chair of the Federal Communications Commission has publicly advocated pricing for individual channels. A true and complete a-la-carte system, however, would be full pay-per-view for all programs, which no

one seems to be advocating. If a-la-carte is to be preferred, why not go all the way?

6. *Telephone*: Among other things, the Telecommunications Act of 1996 was intended to unbundle the local telecommunications grid from telephone-switching services, allowing competitive local exchange carriers to compete with facilities based former Bell operating companies.
7. *Software*: Much of the 1998 Microsoft antitrust case was concerned with the bundling of Internet Explorer with the Windows operating system. Related controversies continue, with the European Commission objecting to security and multimedia software being included in operating systems. In principle, similar objections could be raised whenever a software product incorporates new features that were not contemplated in the earlier versions of the product.

Certainly examples of bundling are not confined to this list. Many products incorporate components that could, in principle and sometimes in actual practice, be sold separately. Phones, for example, are becoming PDAs, MP3 players, and GPS devices. The list above, however, does illustrate that a number of current controversies regarding high technology do revolve around some common themes related to bundling. Because the margin of innovation in many of these technology products is the addition of new functionality, bundling and tie-ins are likely to remain a focus of government intervention in markets.

V. Special Applications to Innovation and Information Markets

A. Patent Pools

Inventions are non-rival goods. Trade secrets can make inventions private property and a patent can secure an invention as private property for a limited time. Either of these forms of protection provides incentives for inventors and a means of recovering the costs of inventing. Patent law further provides a context and an incentive for disclosure of an invention. Under either form of protection, an inventor will capture a return to invention by charging a price for its use that is greater than the marginal cost of using the idea, which generally would be zero. That price may be explicit, in the form of a royalty, or implicit in the form on an elevated price for a good that embodies the invention. Any price greater than zero creates a marginal welfare loss because some useful applications of the idea are not made. This tradeoff between incentives to invent and efficiency in use is well known.

Patent pools are created for a variety of reasons. A common one is to settle patent disputes. Rather than litigate conflicting patents, patent owners may pool their properties and jointly manage the use or licensing of the patents. Another reason for entering patent pools is to alleviate hold-up problems where several patents are required to produce a satisfactory product.

Patent pools vary in their details, but generally involve an entity that holds the patent rights for the members of the pool. Members may be required to contribute new patents for free or for fees that are determined by arbitration or some other means of assessment. Members may have the privilege of using patents in the pool without any royalty or with some established royalty or set of royalties.

George Bittlingmayer (1988) presents an extensive analysis of the Manufacturers Aircraft Association, a patent pool that grew out of the longstanding and bitter patent disputes between the Wright brothers and Glenn Curtis. The Association was formed in 1917 largely in response to wartime exigencies. It was dissolved in 1975 as a result of a consent decree after a long series of government investigations. The main criticism of the pool was that it constituted an agreement to reduce competitive innovation. This seems a strange perspective, given that the pool spans a time interval that brought the aerospace technology from the World War I type biplanes through the 747.

While the pool was in place, members paid a flat fee per airframe built and were licensed, with a few exceptions, to use all of the patents owned by the organization. Payment schemes varied over the life of the organization, and payments declined sharply after the expiration of key Wright and Curtis patents, but generally involved members paying a flat fee per airplane they produced. Bittlingmayer notes a number of concerns that may lead patent owners to participate in pools. Some of these are related to negotiating, contracting, and enforcement costs of various sorts. But he emphasizes the problem of “coordination of access to a public good,” (p. 228) In the context of a broad argument that patent pools serve the purpose of reducing losses from forgone gains from trade, Bittlingmayer further observes, “[A] patent right is a public good. There are jointly realizable gains to the firms in an industry from allowing a particular patent to be used in all applications in which its marginal net contribution is greater than zero.” (p. 244).

Patent pool arrangements vary, with some offering pure bundling and others offering mixed bundling, both to insiders and outsiders. Often licenses are granted, for a set fee, for the use of all of the patents owned by the pool. As Bittlingmayer notes, in this circumstance licensees are confronted with a zero marginal price for using the technology embodied in individual patents owned by the pool. His analysis connects to Bakos and Brynjolfsson: Patent pool bundles in this form exemplify the bundles of large numbers of non-rival goods that they model.

Hazeltine Research Inc. is another patent pool that faced repeated legal action for offering bundles of patent licenses. In 1950, in *Automatic Radio Mfg. v. Hazeltine Research Inc.*, the Supreme Court found that Hazeltine’s bundling practices were not *per se* a misuse of patents¹³. At the time, Hazeltine owned 570

¹³ 339 U.S. 827 (1950)

patents that were used in radio receivers. For royalties that the Court deemed a “small percentage of the selling price of receivers,” Hazeltine granted license to all of these patents. Automatic Radio had taken out a blanket license with Hazeltine, but subsequently refused to pay royalties on the grounds that they had not used the patents in the goods it had produced. The lower court had granted summary judgment to Hazeltine and the court of appeals affirmed.

The Supreme Court held that it was not a *per se* abuse of patents to “require a licensee to pay royalties based on its sales, even though none of the patents are used.” It further rejected an argument that “requiring payment on the basis of the licensee’s sales constitutes patent abuse because it ties in a payment on unpatented goods.” Later it adds:

What [the plaintiff] acquired by the agreement into which it entered was the privilege to use any or all of the patents and developments as it desired to use them. If it chooses to use none of them, it has nevertheless contracted to pay for the privilege of using existing patents plus any developments resulting from respondents’ continuing research.¹⁴

The Court also took note that the lower courts had sustained the licensing agreement “on the theory that it was a convenient mode of operation designed by the parties to avoid the necessity of determining whether each type of petitioners product embodies any of the numerous Hazeltine patents.”¹⁵ Here we see, in 1950, the Court anticipating transactions costs and option value arguments that would become familiar to economists over the decades to come.

Not twenty years later, in *Zenith Radio Corporation v. Hazeltine Research, Inc.* the Supreme Court is less friendly to percentage-of-sales agreements.¹⁶ Although the Court affirmed that percentage-of-sales royalties do not constitute patent abuse if they are chosen for the convenience of the parties, citing *Automatic Radio*, it held that it was patent abuse to use the patent monopoly to “override protestations of the licensee that some of his products are unsuited to the patent or that for some lines of merchandise he has no need or desire to purchase the privileges of the patent.”

What distinguishes *Zenith* from *Automatic Radio* is that in the latter there was no record established that Hazeltine had refused to license individual patents or exclude from royalty calculations the items that did not use any of the Hazeltine patents. In *Zenith*, the district court concluded that Hazeltine had refused to offer a license that covered only goods covered by Hazeltine’s patents. (The case was remanded to examine whether the district court had decided that properly). The Supreme Court found that such a refusal would constitute patent

¹⁴ *Ibid* at 834

¹⁵ *Ibid* at 833, quoting the district court, 77 F. Supp at 496.

¹⁶ *Zenith Radio Corp. v. Hazeltine Research et al.* 395 U.S. 100 (1969)

abuse. But transactions costs arguments as well as the public goods management argument provide support for a percent-of-total-sales royalty. A lower royalty rate on a larger base can collect the same royalty revenues, but can reduce monitoring costs and avoid a positive marginal price on the use of the public good that a patent represents. Once a lower royalty rate based on all sales is set, however, the consumer can try to “cherry pick” certain items that did not use the patents, which we will see as a tactic in the case of blanket licenses.

The series of Hazeltine cases parallel the increasingly hostile treatment of bundles and tie-ins from the nineteen twenties through at least the nineteen seventies. The Chicago influence reversed this trend, at least for a time.

B. Blanket Licenses

Early in the 20th century composers of music decided that they would like to be paid for the use of their music when played in public, such as in restaurants and bars and the courts agreed they had the right to collect payments. Later, these rights were extended to the use of music in radio, and television. Composers formed an organization, the American Society of Composers, Authors, and Publishers (ASCAP) to sell the rights for the public performance of their music. Since then many other such organizations have arisen throughout the world.

These organizations generally sell what is known as a “blanket license” meaning that the purchaser of the license is allowed unlimited access to all the works represented by the license. Due to reciprocal arrangements between these organizations, the works covered by the blanket represent virtually all the commercial music in the world under copyright.

The bundle, however, is not the usual fixed proportions bundle found in economic models. It is, in fact, the equivalent of an all-you-can-eat bundle with virtually every dish in the world, musically speaking, included.

The bundle, in this case, has economic attributes that are superior to those we might expect from a-la-carte pricing, making it similar to the patent pools discussed above. Because a musical composition is an information good—a non-rivalrous good with zero marginal reproduction cost—there are no social benefits to excluding users from using particular songs or in having them economize on the use of already created music. This means that the blanket license induces the efficient use of music for all consumers who take the license. This is a case where it is efficient to have all of the customers to eat until they are satiated. An a-la-carte model, on the other hand, would reduce a customer’s consumption of each product below the efficient level.

As far as the number of customers goes, this is somewhat trickier. It is conceivable that the blanket license might be priced at a level that would deter some consumers unwilling to pay the admission fee. Fortunately, the pricing of

these licenses is normally quite discriminatory, often a percentage of the licensee's revenues, so that there do not appear to be many television or radio stations, for example, that do not purchase the license. This may be due, in part, to the fact that radio and television stations are regulated and their markets do not 'suffer' from free entry.

As we have seen for patent pools, the blanket license has come under antitrust scrutiny as well. In 1948 in *Alden-Rochelle, Inc. v. American Soc. of Composers, Authors and Publishers*,¹⁷ ASCAP was told by the court that its 'exclusive' license form of membership, whereby its members were not allowed to negotiate separately to sell the rights to their music outside of ASCAP, was an antitrust violation. That led to a consent decree whereby ASCAP agreed to change the nature of its membership agreements. In addition, it agreed to not exercise its performing rights over movie theaters (who had brought the case) and to have the price for the blanket license put under the jurisdiction of a court in New York.

Part of the court's decision was based on ASCAP's treatment of its members, whether some members were able to disadvantage other members and potential members through ASCAP's methods of calculating payments, and its voting rules. A part of the consent decree concerned a "through to the audience" clause which meant that composers could negotiate directly with movie producers for their performance rights. Because the producers had to negotiate the synchronization right in this context anyway (involved with putting music into an audiovisual product), the transactions cost savings argument in favor of a copyright collective does not apply. Related to this through-to-the-audience clause was a portion of the consent decree requiring ASCAP to provide 'per program' licenses whereby a radio or television station could clear the rights at the source (when the program was created) and then have a reduction in its blanket license payment.

The mandate for per-program licensing is intended to induce a form of a-la-carte pricing to arise when transaction costs allow it. This mandate seems to reflect a belief that a-la-carte pricing is conducive to efficiency, whereas a bundle, even a regulated bundle, is not. The logic of that belief appears to be that a bundle results in monopoly-like welfare losses, even where the price of the bundle is not controlled by the seller but by regulatory agency. Such reasoning presumes that the regulated rate is too high, although we are unaware of any evidence supporting this belief.

Allowing such 'carve-outs' vitiates the benefits of the blanket vis-à-vis the nonrivalrous nature of the products in question. Allowing carve-outs gives the verisimilitude of competition since it replaces the single performing rights society with many individual composers. The extra 'competition' does not necessarily mean that there is a more competitive outcome, however. Evidence for this extra

¹⁷ 80 F. Supp. 900 (S.D.N.Y. 1948)

competition is often taken from the fact that carve-outs occur, but such behavior may have nothing to do with having a more competitive price on carve-outs.

Here's why. When a carve-out occurs it is necessary to determine how much the blanket license payment should be reduced to account for those songs that are negotiated outside the blanket license. There is no obvious way to do this. If the reduction were made equal to the amount that the music user pays to the composer for the upfront rights, the music user would never have an incentive to negotiate upfront payments, since doing so would not save on overall costs.¹⁸ Thus some pricing system is required.

Remember how silly it seemed to base the cost of automobile parts on their weight? Yet that is the type of system that tends to be used for these carve-outs. The pricing of these carve outs is generally based on the number of minutes of programming covered by per-program licenses relative to the total amount of programming. There are two problems caused by this poor approximation to market pricing. First, it allows for cherry picking by users, since the price of the blanket license is determined for a large group of programs, which have differing musical uses and values. The users can remove below average music use programs (say news) from the blanket license calculation and save as if they had removed a typical music use program. This type of behavior is not efficiency inducing because it allows users to game the system to their advantage with the consequence of distorting prices. Second, because carve-outs confront users with a positive marginal price for the use of music, they induce a use of music that is too low, from an efficiency perspective.

If the regulated price of the blanket license is thought to be correct, (admittedly a difficult decision but presumably one arrived at by the courts) then allowing carve-outs will lead to inefficiency since it merely means that consumers have found ways to lower their payments by gaming the system. In turn, this means that many licensees will find it attractive to engage in this essentially rent-seeking behavior. The inherent inconsistency of the logic involved with establishing what is hoped to be an efficient pricing arrangement, but then allowing carve-outs, does not seem to have been understood by the courts.

C. *Music: MP3s, CDs and DRM*

Although file-sharing has dominated discussions of digital music files, there are several other current concerns about 'bundling' and music files that have arisen in the last few years. The first has to do with business implications from the 'bundling' of individual songs onto CDs and the ability of individual consumers to unbundle these songs and purchase individual songs, one at a time, online. The second has to do with the theoretical possibility that DRM might allow sellers of music to charge for each individual listening experience as

¹⁸ The composer might prefer this solution if the ASCAP collection and payment mechanism doesn't return payments at a sufficiently high level.

opposed to selling the permanent rights to listen to a piece of music, a selling format that is akin to 'renting' the music.

A music CD contains a bundle of songs (with a current average of 14). Although singles (usually pairs of songs sold together) have historically had a presence in the market, the importance of singles has diminished greatly in recent decades. Singles contributed about 10% of total sound recording revenues in 1972, 8% in 1982, 5% in 1992 and less than 1% in 2002. Digital downloads seem likely to increase the importance of singles back toward their prior level (they were at almost 7% in the first half of 2006) although claims that the singles floodgate has been broken are as yet premature.¹⁹

Discussions on many music sites have rained down criticism on record companies for reducing the number of physical singles being sold during the last decade. These are the inevitable criticisms from consumers who believe they will benefit from a-la-carte pricing, a la Jack Nicholson. As we have already seen, a-la-carte pricing always provides consumers with greater freedom than do bundles, although it might do so at a significantly higher cost. As we have also seen, a-la-carte pricing engenders its own set of inefficiencies, particularly in the case of non-rivalrous goods. It is something of a mystery why singles were dropped from the market unless the profit maximizing price for singles in a mixed-bundling situation was so close to the price of a CD that it made no sense to sell them separately. The agitation for a-la-carte pricing seems to stem from an imagined world in which individual components of a bundle of N items would be available for the bundle price divided by N.

Among the small number of people debating these topics, there is a group who decry the possibility of DRM (digital rights management) which, in principle could allow individuals to be charged every time they listen to a particular piece of music (e.g., James Boyle). There are also some commentators who believe that attempts by the industry to 'force' consumers to purchase CDs instead of individual songs is wrongheaded.²⁰

Both CDs and individual songs are bundles. Neither category is a pure a-la-carte purchase. Pure a-la-carte would require that the price paid be a function of usage, whether measured by the number of listening minutes or the number of listening events. It would seem that someone wishing to promote a-la-carte should not be happy with CDs nor with the sale of individual songs.

One could argue that these two cases can be distinguished from one another and that there is a difference between the two bundles. In the case of CDs, some consumers may not value some of the songs on a CD at all, yet may be 'forced' to purchase them if they want the other songs. Where songs are sold

¹⁹ These statistics come from the Recording Industry Association of America as collected over the years by Liebowitz.

²⁰ See, for example, from the inventor of the spreadsheet: <http://www.bricklin.com/softwarepolice.htm>.

individually, all purchasers at least enjoy the song to some extent and no one is forced to purchase something that they do not want at all.

But this is a false distinction. Where songs are sold ‘permanently’ (allowing unlimited use), some users who may only be interested in listening 20 times would be forced to pay the same price as others who listen 50 times or 500 times. Having to pay for unlimited “listens” when only a small number of listens are actually demanded is not different in any fundamental way from having to pay for a CD containing songs in which one is not interested. The same ‘problem’—that consumers pay for something they do not want (non a-la-carte)—exists in both cases.

There actually is a distinction based on economics, although we do not believe it plays any role in the positions taken by most commentators on these forms of bundling. Efficiency in consumption, because music is a non-rivalrous good, requires that consumers not be given an incentive to economize on its use once it is created (and shipped). The purchase of a recorded piece of music, which is an all-you-can-eat affair, presents consumers with a zero marginal cost for listening to the song one more time. This should lead to more efficient consumption of the song than would a pay-per-listen scheme set up by a sophisticated digital rights management system. But it is only superior to ‘renting’ songs once consumers purchase a song. Selling a song (that is, unlimited listens) has a higher bundled price than would exist for a-la-carte pricing where payment occurred each time someone listened to a song. Consumers who would only listen to the song a few times are more likely to be priced out of the market by the ‘bundle’ purchase price than by the pay per listen a-la-carte price.

We thus see the same two margins of consumption here that we find for other non-rivalrous goods: the number of consumers consuming the product versus the amount of consumption per consumer. A-la-carte is better on the first dimension and all-you-can-eat is better on the second dimension.

Without knowing the relative sizes of the deadweight loss from the priced-out consumers of purchased music versus the deadweight loss from the reduced consumption from the consumers of rented music we cannot know whether rental or sales of music is more efficient.

A similar analysis applies to selling albums as opposed to individual tracks. The sale of albums only is likely to deter more individuals from listening to a particular musical performer than would the sale of individual tracks. But if purchased, albums provide consumers with more songs at zero marginal cost from the musical group, which enhances efficiency. So we cannot say whether sales of songs or sales of albums is more efficient, given the non-rivalrous nature of the music.

Could any of the efficiency enhancements typically associated with bundles apply to the sale of CDs versus individual songs or the sale versus the rental of songs?

If it were the case that most consumers who like a particular song tend to like other songs from the same artist(s) then the bundle created by a CD might appeal to a large percentage of fans of the musical group. As an empirical indicator, albums constitute 40% of the digital download market. Because that market provides the only outlet for singles, 40% likely understates the share of the general population that would choose albums over singles when offered a choice. It is also possible that differences among consumers over which songs are most valuable might average out, allowing a bundle to deter fewer consumers than would the sale of individual songs (a la Bakos and Brynjolfsson). Further there are some efficiencies inherent in the creation prerecorded music that do not go away just because of digital distribution. Studio time costs money, not just in terms of the use of the facility, but also the setup costs of having a producer on site, having backup musicians on site and in general just getting prepared for making a recording. Creating an album should be more cost effective than creating 14 separate songs. There may also be economies in publicizing a body of new work in comparison to publicizing one work at a time.

For physical distribution, it is perfectly reasonable to expect that CDs would be more efficient than the sale of singles. It is clearly more efficient to ship one disc with 14 songs than 7 discs with 2 songs each. This is for the same reason that individual short stories are not sold alone but instead in anthologies, that individual articles are not sold alone but instead in magazines, and that French fries are sold in packages and not individually. If the choice were between marketing individual songs or bundles of songs, but not both, it is likely that bundles would be the welfare maximizing solution in a regime of physical distribution. It is also understandable that critics would decry the lack of choice due to a lack of singles, since their concerns are not with overall economic efficiency.

For digital distribution, the case for albums instead of singles loses much of its force. Here, one expects to see mixed bundling consisting of both singles and albums. But if there could only be one type or another, albums might still be the more efficient choice.

For the case of music rentals versus music sales, a DRM system that could monitor and charge for each use, turning music listening into an a-la-carte experience, does not yet exist. Instead we have a crude form of all-you-can-eat rental (Napster, Yahoo) which is basically the equivalent of a blanket license offered to consumers for a fixed monthly fee.

It appears likely that these stark choices may never need to be made. Instead, record companies can (and do) engage in a variety of strategies, which should increase their profits and allow somewhat greater flexibility for

consumers, although the welfare consequences of any particular pricing practice may be uncertain.

D. Tying iPods to iTunes

Apple has created a virtual tie-in by using a proprietary music format that, to the extent it is not circumvented, requires owners of iPods to purchase downloaded music from its own iTunes site.²¹ And, symmetrically, music downloads from the iTunes site can only be played conveniently on an iPod. Although not a contractual tie, Apple's proprietary music format has all the characteristics of a traditional tie-in sale. There is no requirement that consumers purchase any digital music at all (they could just use music ripped from CDs or downloaded from unauthorized sites) but if they do purchase authorized digital music it must come from Apple's web site.

What distinguishes this 'tie' from more traditional tie-in sales is that Apple does not appear to lower the price of iPods or raise the price of iTunes songs as a result of the tie-in. For this reason the traditional price discrimination and risk reduction hypotheses would seem to not apply.

Under the largely discredited leveraging theory, the claim might have been made that Apple was using its near-monopoly in the MP3 player market to achieve a monopoly in the music download market. Under the more contemporary market foreclosure theory, one might suppose that Apple could achieve some monopoly power if it can prevent other firms from competing in the digital download market because the remaining non-tied market is too small to allow competing vendors to achieve the scale efficiencies necessary to survive. If so, Apple would then be able to sell songs at monopoly prices to individuals who do not have iPods. Although this is possible, it requires non-iPod users to circumvent the copy protection (since they cannot play iTunes protected songs on non-iPod players), so this version of leveraging seems fairly far-fetched.

Other facts are also inconsistent with these monopoly scenarios. First, and most importantly, digital downloads are close substitutes for music on physical CDs. CDs, which still make up 90% of the market, will constrain the prices of digital downloads. Second, the monopolizing argument hinges on competitors being driven from the market because they cannot reach a size sufficient to make economies of scale viable. There is no evidence of important economies of scale in this business. In the CD business there are many small independent record labels and many small CD retailers, so on the non-digital side of the market, economies of scale do not seem overwhelming. The digital retail market is quite new but recently we have seen entry into this market, by Microsoft with its Zune player and digital download store and most recently by Yahoo, SanDisk, and Zing with a

²¹ Apple has stated that it prefers an unprotected MP3 format. But when it sells protected music it uses a DRM system that is not compatible with those of any other vendors and Apple does not allow other vendors to license the technology.

complete ecosystem. In addition, there are numerous other websites selling digital music. Since, if anything, the costs of setting up retail distribution seem lower in the digital realm than the bricks-and-mortar realm, it seems unlikely that economies of scale could be larger in the digital realm than in the bricks and mortar realm.

Apple's recent entreaties to the recording industry members to stop protecting their content and switch to the unprotected MP3 format (which has since been accepted by EMI) also are inconsistent with a monopoly story since any digital music retailer can sell MP3 files and they will work with any digital music player (except for an early generation Sony which did not play MP3 files).

An alternative explanation, however, might be that Apple believes that its major competitor to iTunes is the alternative business model of 'rentals,' currently dominated by Napster and Yahoo. These services allow consumers access to a vast collection of songs for a monthly fee, but access to those songs disappears when subscription payments end.²² By making digital downloads more valuable to consumers, the rental alternative loses some luster since rentals must be kept in a protected form to keep a consumer from paying his monthly fee once and copying an enormous collection of music. It is also the case that by dropping copy protection, Apple would nullify criticism from the EU regarding interoperability problems with its copy protection scheme. Therefore, Apple's motivation for its move to MP3s may be more self serving than it looks at first glance.

Still, the evidence leads to a conclusion that the main purpose of Apple choosing a proprietary technology for its iTunes store and iPods would be the welfare enhancing goal of giving consumers a simple and effective experience when purchasing music and transferring the music to a digital music player. Apple faces competition in the market for MP3 players, and there are alternative sources for MP3, both on-line and off. Further, as noted above, the monopoly leverage and monopoly exploitation explanations of tie-in and bundling don't seem to match up with the facts of this market. Apple's 'tie' therefore, would seem to occur for the same reason that the vast majority of ties or bundles occur: to provide a superior consumer experience that increases market share and profits for the firm.

E. Cable Television

Consumers of cable or satellite television offerings are given choices that consist of large bundles of stations, to which premium channels such as HBO or Showtime are then added. Critics complain that these practices force consumers to pay for channels that they do not watch.

²² In 2006 subscription services generated revenues about 23% of Apple's estimated iTunes revenues.

This criticism is akin to the claim that diners in restaurants are forced to pay for food that they don't want if a meal contains food that they don't like if substitutions are not allowed. More closely, it is akin to a claim that consumers in an all-you-can-eat buffet may choose not to partake in every dish but nonetheless must pay for every dish that is available. It is true that consumers would get more flexibility if restaurants were required to make substitutions on the menu (after all, who doesn't root for Jack Nicholson when he tells the waitress where to hold the chicken) but since no one denies that the restaurant market is competitive it is generally understood that such a requirement would raise the cost of restaurants and in the end harm consumers. We know this because consumer behavior in this competitive market reveals that many consumers prefer to patronize restaurants that have do have limits on substitutions, but offer other characteristics that consumers prefer, such as lower prices. No one calls for government regulation of restaurant menus because all this is widely, if only implicitly, understood.

This observation has not stopped attempts to tamper with the cable television market. What is it that might replace the current system? One possibility would be to force cable and satellite operators to go to a partially a-la-carte pricing system, which we call pay-by-station, whereby consumers get to pick only the channels that they desire and bundles are eliminated.²³ Some critics of the current system claim that they only want to introduce mixed bundling into the system and not require full pay-by-station.²⁴ We discuss these choices in turn.

Hazlett discusses the choice between picking individual stations versus bundles of stations. He correctly points out that the price of individual stations would be higher than the prorated share of the bundle price.²⁵ This can be easily illustrated by assuming that all the market participants earn normal returns on their investments (such assumptions are compatible with the current bundled environment and do not alter the arguments made in favor of pay-by-station). We also assume that cable operators are sufficiently able to maximize profits that they do not include any stations whose value to the bundle is less than the cost of the station (implying that each station has some viewers). Under such assumptions, the revenues generated are just able to pay for the costs of creating the programming. If we allow consumers to pay for only the stations that they watch, we would need to generate the same revenues as before the rearrangement in order to cover the costs of the same programming. On average, it would be impossible for consumers to save anything; although consumers who watch fewer stations than average might pay less, consumers who watch more than average are likely to pay more. Cable operators and program creators would be indifferent if the same revenues were generated and their costs didn't change, although, as we will see, this will not be the case.

²³ We refer to this as pay-by-station in spite of the fact that it has been referred to as a-la-carte because full a-la-carte would be full pay per view where viewers only pay for the content they watch on any given channel, by the hour or minute. Since no one is proposing full a-la-carte, we do not discuss it here.

²⁴ Cooper and Kimmelman 2004.

²⁵ Hazlett 2006, pp 14-17

Consumers as a whole would be harmed in one particular and important manner, however. If consumers were to choose their sets of stations for the month they might discover that there is some program that they wish to watch that's on a channel that they haven't chosen. These are specific instances out of potentially many instances where consumers might value some small amount of programming that would fall below the critical value that would lead them to subscribe to that channel. This is the "option value" in having channels available that you do not usually watch. In a pay-by-station world these consumers would not get to watch those programs. For ordinary products this limitation would be fine since the value that the individual consumer places on the product would presumably be less than its cost. But the programs on cable are non-rivalrous goods for which there is no incremental cost to having an additional viewer. Thus it is inefficient to prevent the viewer from seeing these programs. The traditional cable bundle allows them to indulge in small scale consumption and to generate value from that. Pay-by-station would not.

Admittedly, there may be consumers who would like to watch some programs but are unwilling to pay for the entire bundle and in this case bundling would cause harm by reducing consumption on the margin of subscribing to the bundle or not. But as Hazlett demonstrates, it is unlikely that such consumers would be willing to cover the fixed costs involved with being connected to cable in the first place. Those incremental costs are real, so that the loss of option value is likely to be greater than the loss from those who elect not to subscribe at all.

One might argue that even if consumers do not benefit from pay-by-station, that the market would benefit from the superior economic signals being revealed by consumer choices of the channels actually purchased as opposed to relying on cable operators to decide what channels go in what bundles. This, however, is always an advantage of a-la-carte, but as we have seen, it is usually outweighed by the cost savings in providing bundles. That is presumably the case here as well.

This last point is made forcefully by considering mixed bundling. It is always possible, if there are no transactions costs, for a seller to make greater profits with mixed bundling than with pure bundling. This can be achieved merely by making the price of individual items high enough that the profit on them is greater than the profit on the bundle, so that any defections away from the bundle to individual stations increase overall profits. (Because individual stations, even with a high markup, can be much less expensive than the entire bundle, certain viewers might prefer to pay for individual stations.) In this case, why would cable operators not embrace mixed bundling?

The answer must be that there are costs involved with going to a mixed bundling scheme, the same costs involved with going to a pay-by-station scheme. These costs include switching away from analog to digital converters, since it is only the latter that allow for frequent switching of station availability. There are other costs as well, including the costs of changing the billing to the consumer

and the payments from the cable operator to the cable networks every time a consumer change his mind about what stations to order, requiring extra staff to answer questions about these options, and so forth. It seems likely that these costs are large (as discussed by Hazlett) and this fact explains why there is no mixed bundling. But even if all consumers had digital converters these other costs might still be larger than the benefits. If technology lowers these costs sufficiently we would expect that cable operators would move to a mixed bundling system on their own since it would be in their self interest to do so. That they do not suggests that transactions costs remain large, relative to the available benefits.

Further, it is likely that cable operators oppose mixed bundling because they expect that imposed pay-by-station would be accompanied by price regulation. After all, absent some price regulation, cable operators could easily circumvent any mixed bundling pay-by-station mandate by charging a high enough prices for individual channels that few, if any, consumers would elect pay-by-station, so any meaningful unbundling mandate would have to include price controls.

Customers may naïvely believe that the single channel price will be their bundle price divided by the number of channels in the bundle. Regulators may cynically give them pay-by-stations options. But since customers will be unhappy with the likely result, some regulatory alternative will be found, but no alternative is likely to enhance efficiency.

F. Telephone

For the U.S., the Telecommunications Act of 1996 mandated unbundling of the “network elements” that are used in the production of various telecommunications services. The full title of the act declares congressional ambitions: “An act to promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications and encourage the rapid deployment of new telecommunications technologies.”²⁶ Conventional voice telephone, or switched wireline telephone service, involves the use of a number of facilities including end user hardware, local connection to a network switch, switching, and in some instances, long distance transit. In addition to providing the connection itself, providing telephone service also requires marketing, billing, repair and information. Historically, consumers just made phone calls, taking no action to combine these network elements, whether or not they were provided by distinct entities. More realistically, they simply purchase a single service, something they regarded as a single good, much like they would regard an automobile, though made of many distinguishable components, as a single economic good. Until recently, all of the elements of local residential calls typically were provided by one firm. Commercial users have made use of more varied arrangements, particularly since the breakup of AT&T in 1982.

²⁶ Telecommunications Act of 1996, P.L. No. 104-104, 110 Stat. 56.

The breakup of the Bell monopoly that took place on the heels of the 1982 settlement left in place various local monopolies, identified as “incumbent local exchange carriers” or ILECs. By numbers of subscribers, the bulk of these ILECs were pieces of the former Bell system. The unbundling mandates of the 1996 Act reflected the view that the local exchange function was subject to scale economies and that the ILECs had developed their facilities as monopolies protected by public utility franchises. Consequently, the argument went, competitive entrants lacked certain advantages accorded to the incumbents. In turn, it was alleged that that entry would not take place unless new entrants, the competitive local exchange carriers or CLECs, were given access to certain ILEC facilities that were subject to increasing returns to scale.

The Telecommunications Act’s unbundling requirements are many and specific. Any local carrier is obligated to permit resale of its telecommunications services, number portability, dialing parity to competitive carriers, and access to rights of way (poles, ducts and conduits). Carriers are also obligated to make arrangements for reciprocal compensation; that is, accepting fees in exchange for providing transport and termination of calls from other carriers and paying equivalent fees for using those services when provided by those carriers. The ILECs are subject to extensive additional obligations. Principal among them is a duty of the ILEC to provide interconnection with the facilities of any requesting telecommunications carrier at any technically feasible point. Further, the ILECs are obligated to provide unbundled network elements to any requesting provider.

The theory was that these provisions would permit competitive entry into local telephone services. Entry of competitive carriers that would resell services provided by the incumbents, or provide services using their own facilities combined with unbundled network facilities of the incumbents, would cause prices to fall. These competitive carriers, it was hoped, would gradually develop their own facilities that would replace the services of the unbundled network elements that were to be provided initially by the incumbents.

For the most part, whether network elements are unbundled or not, consumers at the retail level purchase local telephone service from a single entity. That is to say, few of us seek to assemble, though our own contracting, the various network elements that are necessary to achieve local telephone service. Instead, the mandated unbundling allows providers to assemble these elements so as to provide the retail customer with a product. In this regard, the “bundling” that is under attack is more nearly a kind of vertical integration as opposed to a grouping of final goods.

Although the surface explanation of the bundling that existed at the time of the Telecommunications Act was historical, the theory of bundling that best reflects the foundation of the government’s intervention is market exclusion. The underlying view is that some elements of the telecommunications network were natural monopolies, and consequently the bundling of those network elements with others would lead to monopolies in all of them. Of course, to the extent that

the key network elements are consumed in fixed proportions, the fact of multiple monopolies would be of little consequence. Further, there don't seem to be many uses of one network element in isolation. That is, there aren't people who use telephone switching, for example, without transport.

Because of mandatory unbundling, telephone service offers a useful real-world test of the effectiveness of anti-bundling policies. Jerry Hausman and Gregory Sidak (2005) have provided a very detailed examination of the effectiveness of mandatory unbundling. Interestingly, bundling mandates were implemented not only in the U.S., but also in several other industrialized countries, all at about the same time. Hausman and Sidak study the consequences of telecommunications policies in five countries: the U.S, the U.K., Canada, New Zealand and Germany. All of these, except New Zealand, adopted some form of mandatory unbundling. New Zealand adopted more modest measures under its antitrust laws. Its Telecommunications Act of 2001 directed its Commerce Commission to determine whether unbundling was necessary, but the Commission concluded it was not, observing, "In a significant number of countries, the gains from local loop unbundling have been disappointing."²⁷ Hausman and Sidak identify four distinct rationales for mandatory unbundling of telecommunications network elements: Fostering competition at the retail level, reducing or removing entry barriers, providing a "stepping stone" that would allow competitive local exchange carriers to establish their own network facilities, and strengthening wholesale competition.

In impressive detail, Hausman and Sidak examine the outcomes regarding each of these rationales. Their conclusion: "An empirical review of the unbundling experience in United States, the United Kingdom, New Zealand, Canada, and Germany suggests that none of the four rationales is supported in practice."²⁸

Of course, telecommunications has changed dramatically since the mid-nineties, but for reasons that have very little to do with unbundling mandates and everything to do with cross-platform competition. Wireless telephony, broadband data traffic and voice over internet protocol have brought dramatic changes to how people communicate. This history offers an important lesson. Competition for these network related goods is likely to arise from entirely different technologies, fully developed into networks of their own, rather than replication of part or all of existing networks.

G. Software

The U.S. antitrust case against Microsoft was based on Microsoft's bundling of Internet Explorer (IE) into the operating system and the supposed

²⁷ New Zealand Telecommunications 1987-2001, Publication No. 8, paragraphs 8-9 (August 2001) (As quoted in Hausman and Sidak).

²⁸ Hausman and Sidak, at 245.

competitive advantage to IE from being included in the Windows operating system. More recently, as part of its antitrust case against Microsoft, the European Commission claimed that Microsoft's bundling of its "Windows Media Player" into the Windows operating system excluded other media players. The EC case is specifically about 'market foreclosure' and although there was a strong market foreclosure aspect to the U.S. case it was not the central thesis. Instead, the U.S. case required that the main competitor to IE, Netscape's Navigator, be viewed as a competitor to the operating system itself in order to fit a theory that Microsoft was trying to protect its monopoly, Windows, from competition. There is one important economic difference between these instances of bundling products into the OS and all the other examples so far discussed—the product being added to the bundle was sold separately for a price of zero. Further, Microsoft's competitors in the browser market and the media player market also charged a zero price for their products.²⁹ As a consequence of these zero prices the price of the bundle appears not to have been impacted by the inclusion of a browser.

The fact that a component of a bundle is available for a price of zero is highly relevant. Specifically, the market foreclosure model no longer makes sense when the going price of the foreclosed good is zero. In the normal foreclosure story, the consumer doesn't purchase the foreclosed product because he acquires an alternative product in the bundle. Having acquired brand A as part of a bundle, the amount he now is willing to pay for brand B is lower than it would be if he didn't already have the brand A product, perhaps as low as zero.³⁰ But where both goods are being made available for free, diminishing a consumer's willingness to pay is irrelevant. A consumer can still acquire the brand B product at the prevailing price of zero and will do so as long as it offers any advantage over having the brand A product alone.

In the cases at hand, consumers could add and use as many browsers or media players to their computers as they wished. With a zero price, the only factor that would seem important in the consumer's choice of a browser or media player would be the quality of the product as judged by the consumer. Generally, situations where products have zero prices would seem to provide the ideal circumstances for consumers to choose the highest quality brand or brands. So how can foreclosure be resurrected as a theory in the case where products have a zero price? It requires that we look beyond standard economic assumptions.

²⁹ The vendors of these products made their money by selling server-side software that presumably worked best with their consumer software. Nevertheless, particularly for the cases of media players, Microsoft made its compression routine public so that any competing producer could allow its player to play Microsoft encoded music and any creator of server software could encode its software with Microsoft's compression

³⁰ If brand A and brand B have identical values to a consumer, then the value of brand B becomes zero once the consumer acquires brand A.

The standard economic model most often does not make a distinction between the price paid by the consumer and the price received by the producer. One example where the two do differ is an excise or sales tax where the price paid by the consumer is greater than the amount received by the producer. It is also possible that the full price paid by the consumer might include other costs, such as a delivery fee not received by the producer. Much of the focus of the antitrust actions regarding browsers and media players has been on this delivery cost. The foreclosure theory modified to take this delivery cost into account basically says that even though the price of the product might be zero, the real cost to consumers differs for the bundled brand (Windows Media Player) versus the competing brand (RealPlayer, for example). Although the nominal price of these products might be zero, the real price is greater than zero. The real price amounts to the cost of having this product delivered. Note that the advantage to the Microsoft product is not due to bundling per se but instead is due to the lower cost of delivery brought about by the fact that the product is delivered with the hardware purchase, providing a marginal delivery cost of zero. Bundling is irrelevant except for its impact on distribution costs.

Because Windows Media player comes with Windows, which itself comes installed on the computer, the delivery cost of the media player to the consumer is zero. Since RealPlayer does not come with Windows, its cost to the consumer is somewhat greater than zero. The cost of RealPlayer is the time and effort taken to download it.

How large is this download cost? For anyone who has ever tried to download one of these programs, except for the cost (imposed by Real) of navigating through the more expensive versions to find the free version, getting the free RealPlayer only requires clicking a few buttons on the computer screen. One then waits a few seconds or minutes, depending on the speed of the connection, to download the program. The consumer can work on other projects while the product downloads. One then clicks a few more buttons to install the program. How costly is this? How much of an advantage is it that the bundled program doesn't require this effort?

The antitrust authorities seem to want to say that any advantage is too much and needs to be remedied. They have not stated that some minimum level of advantage is required before prosecution is brought or before a guilty verdict is rendered, merely that the sign of the (dis)advantage be known. Surely this is incorrect.

There are always, in real-world markets, important variations in consumer perceptions of differentiated products. If one party has an artificial advantage, before we can conclude that the advantage might overturn market outcomes, we need to know something about the size of the advantage. If, for example, some government regulation provides Mercedes a one dollar advantage over BMW in the production of its automobiles, it would not be worth anyone's time or effort to try to reestablish market parity between the two.

Assume that Microsoft has a *de minimis* advantage over Real in the distribution of its media players. Would this be something for antitrust regulators to worry about? Common sense tells us that it is not. An insignificant advantage is not going to impact the market in an important way. It is certainly unlikely to foreclose a competitor.

The government's case hinged on the claim that clicking your screen a few times is an important cost for many consumers. If it is not an important cost, then there is no case against Microsoft including these programs in Windows. We do not believe that this is an important cost. If it were, Adobe Acrobat and the Flash Player would not be on virtually every computer in the world. A positive price restricts usage, after all, and consumers often have to download and install Acrobat and Flash in order to use them. Nor is it likely that Google could have entered the English language as a verb if it were difficult for people to click on its computer buttons. Clicking on screens is the *sine qua non* of graphical computer operating systems, which are the only kinds of systems used by ordinary consumers. To claim that it is costly to make those clicks strikes us as unreasonable.

But suppose we are wrong about this. Suppose that it really is costly, in a significant way, for consumers to acquire these products. Then prohibiting the bundle imposes an acquisition cost on consumers that could readily be avoided. Computer manufacturers would have an incentive to have already installed such free software on the computer if consumers benefited from such installation. Further, we have already considered the world in which it is costly for consumers to acquire and assemble the components necessary for a usable product. That is the world in which automobiles are sold as assembled products rather than components. In such a world, consumers would ignore an unbundled option in favor of a bundle unless the unbundling is mandated and also includes price regulation that makes the unbundled option artificially attractive. Such a world clearly imposes extra costs, which should be weighed against any putative benefits of unbundling that might be thought to be forthcoming.

H. Unbundling as Market Foreclosure

What's this? An eighth suspicious bundle? No, just a topic we think shows the strained nature of market foreclosure arguments, but haven't figured out where else to put.

Antitrust cynics sometimes observe that charging a relatively low price is illegal because it is predatory, charging a relatively high price is illegal because it proves you are a monopolist, and charging the same price as everyone else is illegal because it means you're colluding. Unbundling may offer its own version of the joke.

It is rare, but unbundling can expose a firm to public criticism and even legal action. Examples of the former concern intellectual property products that are sold with reduced functionality. The famous example is Intel's SX microprocessor that was sold with an incapacitated coprocessor. In that case, the functionality that was being removed from the processor was available at zero (arguably even negative) marginal cost. The criticism, not entirely ill-founded, was that Intel could have made the fully capable processor available, but chose not to, instead preferring to "force" people who sought greater capacity to pay a higher price for the fully functional device. Of course, as is the case for other forms of price discrimination, it is unclear whether this behavior was welfare enhancing or reducing. If only one version of the processor had been on the market, some consumers of the cheaper processor are likely to have been priced out of the market, which would have made them worse off.

Microsoft has been criticized for everything, of course, so going to that well for an example might be likened using a gun for indoor fishing. Still, there is an interesting example here as well. In an amicus brief submitted by the law firm of Wilson, Sonsini, Goodrich & Rosati, in opposition to the 1995 Microsoft consent decree, an unbundling is deemed predatory:

With the introduction of Windows 3.1 in April, 1992, Microsoft removed the debug kernel from the operating system and bundled it with its own language application program. If a user wanted to run the competitive Borland program, it had to buy the debug kernel separately from Microsoft, at a price Microsoft set to make the Borland product less competitive. Microsoft even conspicuously advertised the fact that its own product was cheaper than the Borland product because the user had to buy the debug kernel separately from Microsoft. Byte, May 1992, at 159 (Ex. 6). Whatever pro-competitive benefits Microsoft might advance to justify its bundling of new functionality into the operating system, it is difficult to imagine any justification for unbundling operating system technology, other than harming competition.³¹

Actually it's pretty easy to imagine a justification. With the change, Microsoft was able to sell more of its own products, presumably at profitable prices. Predation in antitrust typically is limited to the circumstance that an action is unprofitable, but for the expected departure of a competitor. In this case, its strategic action allowed it to increase revenues. The unbundling may well have made a rival's products less attractive, but that is known as competition, which often harms competitors. What we have here is a novel theory in the antitrust of bundling that the firm has an obligation to provide application software components that their rivals would rather not create themselves. Note further the implicit logic of the amicus brief. Because the debug kernel is a public good, it costs Microsoft nothing to include it in the bundle, so Microsoft is deemed to have an obligation to include it as part of the operating system.

³¹ Wilson , Sonsini Amicus Brief, at 62.

There is a cockeyed symmetry between this instance of unbundling, for which Microsoft was criticized before the court, and the bundling of Internet Explorer, for which Microsoft was also criticized before the court. Both items, arguably, were middleware. In one case, excluding middleware was predatory because it hampered one rival's application. In the other case, including middleware was predatory because it competed with a different rival's middleware.

Unbundling is also considered bad behavior in consumer lending and medical billing. In consumer lending, lenders appear to run up the transactions fees by charging high prices for many individual items instead of charging a lower price for an available bundle of services. In medical "coding" it is not uncommon to charge for many individual procedures instead of charging for the comprehensive procedure that bundles a number of individual components at a lower price. In both fields the practice is considered unethical and, in some instances, illegal, and probably should be.³² In both instances, some agent is making a selection of purchases on behalf of the customer that is not in the interest of the customer, and about which the customer is not fully informed. What is interesting in these cases is the regulatory presumption that bundling is in the consumers' interests, as it almost certainly is. This bundling has much in common with efficient bundles that we commonly see in competitive markets.

VI. Hope for Bundling Policy?

As evidenced above, bundling is addressed in multiple areas of the law, including the antitrust laws, patent abuse doctrines, and telecommunications regulation. Through the early nineteen seventies, antitrust treatment of bundling, like antitrust treatment of most things, became progressively more interventionist. That trend was reversed somewhat in the nineteen eighties, under the dual influences of the Reagan administration and the Chicago School. Some cases began to cite theories of tie-in sales that find the practice to be benign or even efficient. In the nineteen nineties, in spite of the rise of a post Chicago antitrust economics, there has been something of a trend toward a rule of reason regarding tie-in sales. Arguably it is now telecommunications law that is the arena that is most hostile to bundles and tie-in sales.

In telecommunications, the major thrust of the Telecommunications Act of 1996 was to compel owners of telecommunications networks to accommodate connection by competitive carriers, in effect unbundling switching services from signal transport. The act also imposes price regulation schemes that require facilities owners to rent their facilities at "cost", somehow determined. Regarding cable television, the Federal Communications Commission, through its chair, has steadily attacked the practice of cable

³² For example, on medical bundling see Testimony on Fraud in Medicare Programs by Michael F. Mangano, Principal Deputy Inspector General, U.S. Department of Health and Human Services, Before the Senate Committee on Government Affairs, Permanent Subcommittee on Investigations, June 25, 1997. Also see Federal Bureau of Investigation, Financial Crimes Report to the Public, Fiscal Year 2006.

providers of marketing their services as bundles of channels.³³ On another front, legislation requiring net neutrality would, in effect, prohibit firms that provide broadband connections from tying internet video services and other premium internet services to high performance broadband service.

While the FCC appears to be becoming ever more hostile to bundling, antitrust law may be moving the opposite direction. In *International Salt*,³⁴ tie-in sales were brought under Section 1 of the Sherman Act, with the Court finding that it was “unreasonable, per se to foreclose competitors from any substantial market.”³⁵ This treatment was more fully articulated in *Northern Pacific*.³⁶ After citing a litany of the wrongs done by tying agreements, the *Northern Pacific* Court says of tie-in sales: “For these reasons, tying agreements fare harshly under the laws forbidding restraints of trade.”³⁷ And then: “They are unreasonable in and of themselves whenever a party has sufficient economic power with respect to the tying product to appreciably restrain free competition in the market for the tied product and a ‘not insubstantial’ account of interstate commerce is affected.”³⁸

*Jefferson Parrish*³⁹ draws on *Northern Pacific* and further develops the per se doctrine, although *Jefferson Parrish* confronted the Court with the issue of whether the tied good was distinct from the tying good. These rulings are commonly summarized by three conditions that, if satisfied, render a tie-in per se illegal: i) the tying good and the tied good are distinct; ii) there is market power in the tying good; and iii) a not insubstantial amount of commerce in the tied good.⁴⁰

There are well known exceptions, such as *Jerrold Electronics*⁴¹, where a company’s interest in assuring and demonstrating the performance of a technology was held to be a justification of a tie, but only until the technology becomes established. In both *International Business Machines* and *International Salt*, the courts noted that an interest in quality control could justify a tie, but rejected the legitimacy of the quality claims in the cases before them. These exceptions have led some to offer a fourth requirement for per se unreasonableness, the absence of any efficiency defense.⁴²

³³ Amy Schatz and Joe Flint, “FCC May Endorse Cable à la Carte In a Policy Shift,” Wall Street Journal, November 29, 2005.

³⁴ *International Salt v. U.S.*, 332 U.S. 392 (1947)

³⁵ *Id.*, at 397.

³⁶ *Northern Pac. Ry. Co. v. United States*, 356 U.S. 1 (1958).

³⁷ *Id.*, at 6.

³⁸ *Id.*

³⁹ *Jefferson Parrish Hospital District No. 2 v. Hyde*, 466 U.S. 2 (1984).

⁴⁰ For example, see Scherer and Ross, pp. 567-568.

⁴¹ *United States v. Jerrold Electronics Corp.*, 187 F. Supp. 545 (E.D. Pa. 1960), *aff’d per curiam*, 365 U.S. 567 (1961).

⁴² For example, see Greer, p. 569

Jefferson Parrish is mostly noticed for its treatment of the two-goods question. On that issue, the Court found that the tied good was distinct if there is sufficient demand for the tied good alone, in the absence of a tie, to sustain a separate market. Otherwise, the tie could not foreclose anything. That, in itself, is a limitation on the per se rule. But the court's decision on the case rested on its conclusion that a per se rule did not apply because the hospital didn't have sufficient market power to trigger the per se rule, and ultimately that the plaintiff had not presented a case that would allow a finding that the tying practice had, in fact, unreasonably restrained competition in the anesthesia market.

The *Jefferson Parrish* Court also acknowledges the commonplace value of tie-ins, "Buyers often find package sales attractive; a seller's decision to offer such packages can merely be an attempt to compete effectively—conduct that is entirely consistent with the Sherman Act."⁴³ And later:

Thus the law draws a distinction between the exploitation of market power by merely enhancing the price of the tying product, on the one hand, and by attempting to impose restraints on competition in the market for a tied product, on the other. When the seller's power is just used to maximize its return in the tying product market, where presumably its product enjoys some justifiable advantage over its competitors, the competitive ideal of the Sherman Act is not necessarily compromised⁴⁴

This position significantly raised the bar in regard to the required showing of market power and the likelihood of competitive harm. In earlier cases,⁴⁵ the tie itself was treated as sufficient evidence of adequate market power in the tying good to trigger the per se rule. Ultimately, the *Jefferson Parrish* court did decide the case on this point, finding that East Jefferson Hospital did not have market power sufficient to affect the tied market. The Court is fairly explicit in adopting a market foreclosure standard: "Of course, as a threshold matter, there must be a substantial potential for impact on competition in order to justify per se condemnation."⁴⁶

The opinion of the D.C. Circuit Court of Appeals in *U.S. v. Microsoft*⁴⁷ is something of a treatise on tie-in sales. It goes further down a path of acknowledging both the potential value of bundling and its pervasiveness before rejecting a per se rule for computer software. In examining the *Jefferson Parrish*'s market-demand test for the existence of separate goods, the court goes on at some length on the subject of the efficiencies of tie-in sales in general, making arguments not too different from our comments about car parts:

⁴³ *Jefferson Parrish*, 466 U.S. at 12.

⁴⁴ *Id.*, at 14

⁴⁵ *Northern Pacific Railroad Co. v. U.S.*, 356 U.S. 1, 7-8, (1958).

⁴⁶ 466 U.S. at 16.

⁴⁷ 253 F. 3d 34 (D.C. Cir. 2001), *cert. denied*, 534 U.S. 952 (2001).

Indeed, if there were not efficiencies from a tie (including economizing on consumer transaction costs such as the time and effort involved in choice), we would expect distinct consumer demand for each individual component of every good. In a competitive market with zero transactions costs, the computers on which this opinion was written would only be sold piecemeal—keyboard, monitor, mouse, central processing unit, disk drive, and memory all sold in separate transactions and likely by different manufacturers.⁴⁸

The court then makes this general and useful observation:

In the abstract, of course, there is always direct separate demand for products: assuming choice is available at zero cost, consumers will prefer it to no choice.” Later the court adds, “The ubiquity of bundling in competitive platform software markets should give courts pause before condemning such behavior in less competitive markets.⁴⁹

Finally, the court gets to the heart of the problem with the *Jefferson Parrish*’s test for the existence of separate products:

In fact, there is merit to Microsoft’s broader argument that *Jefferson Parrish*’s consumer demand test would “chill innovation to the detriment of consumers by preventing firms from integrating into their products new functionality previously provided by standalone products—and hence, by definition, subject to separate consumer demand.⁵⁰

The court then struggles to distinguish software integration from other forms of bundling. Indeed, it does succeed in distinguishing software integration from some particular instances in bundling. But then it uses cases of non-software integration to expose the problems with the per se doctrine:

Under per se analysis, the first firm to merge previously distinct functionalities (e.g., the inclusion of starter motors in automobiles) or to eliminate entirely the need for a second function (e.g., the invention of the stain-resistant carpet) risks being condemned as having tied two separate products because at the moment of integration there will appear to be a robust “distinct” market for the tied product.⁵¹

⁴⁸ 253 F. 3d at 74.

⁴⁹ *Id.*, at 83.

⁵⁰ *Id.*, at 76.

⁵¹ *Id.*, at 82.

With these arguments, the D.C. Circuit carves out an exception for to the per se doctrine concerning tie-in sales that applies to software. But the court also observes that the characteristics that justify the carve-out for software are not limited to software: “We fear that these efficiencies are common in technologically dynamic markets where product development is especially unlikely to follow an easily foreseen linear pattern.”⁵²

In short, markets for innovative goods of all sorts will involve products that combine new functionalities or enjoy economies of marketing bundles of goods. A per se standard will be a cudgel available wherever a product achieves a degree of market power, that is, wherever an innovation succeeds.

VII. Conclusion

We have argued, as others do, that bundling is pervasive in the economy. For many of the goods with which we have a great deal of experience, we don’t even perceive bundles; the bundle of components has become a single good. Such bundles typically offer substantial economies in production, transportation, and marketing costs. New products will often be new bundles of capabilities.

Economists have offered many explanations of bundling and tying. Many of these show the practices to be efficient in one way or another. Some explanations of bundling do show it to be a means to extract greater profit from monopoly, but nevertheless have ambiguous welfare implications. The surviving explanation of tie-in sales that shows the practice to have antitrust implications is the market foreclosure argument. That explanation requires that conditions be just so. For foreclosure to occur, the tied market must be not too big, but not too small. The same must hold for the tied share and the minimum efficient scale. Nevertheless, it could happen that a tie-in will foreclose a market, providing two monopolies where there was only one before. Foreclosure has long been recognized as a possibility; it just hasn’t been thought to be very likely.

Contemporary markets in new products are probably not all that different from old markets in products that were new at the time, combining attributes and capabilities that were once understood as being distinct goods. “Technologically dynamic markets,” or for that matter, institutionally dynamic markets, or socially dynamic markets, seem regularly to give rise to controversies around tying and bundling. Dynamism of many sorts will be hindered by policies that condemn all such combinations, failing to distinguish the few instances that may be harmful from the great majority that are not.

⁵² Id., at 94.

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