NBER WORKING PAPER SERIES

EMPIRICAL EVIDENCE ON CONDITIONAL PRICING PRACTICES

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Working Paper 22313
http://www.nber.org/papers/w22313

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2016

The authors thank Tim Lee and Xiaojie Li for excellent research assistance. All errors are our own. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 22313
June 2016
JEL No. K0,K2,K20,K21,L0,L4,L42

ABSTRACT

Conditional pricing practices allow the terms of sale between a producer and a downstream distributor to vary based on the ability of the downstream firm to meet a set of conditions put forward by the producer. The conditions may require a downstream firm to accept minimum quantities or multiple products, to adhere to minimum market-share requirements, or even to deal exclusively with one producer. The form of payment from the producer to the downstream firm may take the form of a rebate, marketing support, or simply the willingness to supply inventory. The use of conditional pricing practices is widespread throughout many industries, and the variety of contractual forms used in these arrangements is nearly as extensive as the number of contracts. This paper reviews empirical evidence on these arrangements.

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Empirical Evidence on Conditional Pricing Practices*

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May 28, 2016

Conditional pricing practices allow the terms of sale between a producer and a downstream distributor to vary based on the ability of the downstream firm to meet a set of conditions put forward by the producer. The conditions may require a downstream firm to accept minimum quantities or multiple products, to adhere to minimum market-share requirements, or even to deal exclusively with one producer. The form of payment from the producer to the downstream firm may take the form of a rebate, marketing support, or simply the willingness to supply inventory. The use of conditional pricing practices is widespread throughout many industries, and the variety of contractual forms used in these arrangements is nearly as extensive as the number of contracts.

Table 1 presents a selected group of conditional pricing practices and the range of industries they cover, based on both court-based evidence and empirical research. Vertical rebates include both loyalty contracts and all-units discounts, and have been used in the microprocessor and confections industries.[1] Vertical bundling contracts include full-line forcing contracts and bundled discounts, and have been observed in the markets for video rentals, truck transmissions, boat engines, tape products, and some pharmaceuticals. Exclusive dealing has been used in the video game, mobile phone, and hospital services industries. A much richer set of contracts is employed across many more industries in reality.

Conditional pricing practices have been challenged in courts in recent years, which has attracted a considerable amount of attention from law practitioners, economists, and government agencies. In *LePages v. 3M (2003)*, 3M was the dominant player in the market for branded tape products, but was facing competitive pressure from private label tape manufacturer LePages. 3M responded by entering the private label tape market and offering clients discounts on bundles consisting of private label tape and other of its office products. LePages could not match this strategy because of its limited product line, and filed suit claiming that 3Ms conduct was exclusionary. The Third Circuit ruled in favor of the plaintiff even though

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[1]We refer to a vertical rebate as a loyalty contract if it is conditional on a market-share requirement, and an all-units discount if it is conditional on a quantity requirement.

there was no finding that the defendant was pricing below cost. The ruling was criticized for departing from the previously established practice of applying a price-cost test in similar cases.

Table 1: Evidence on Conditional Pricing Practices

Industry	Product Coverage	Nature of Restriction	Downstream Competition
Court-based Evidence:			
Truck Transmissions (*ZF Meritor v. Eaton Corp.)*	Single	Share	Standard
Auto Refrigerant Equip (*SPX Corp. v. Mastercool Inc.)*	Single	Share	Standard
Tape Products (*LePage's v. 3M)*	Multiple	Quantity	Standard
Boat Engines (*Concord Boat v. Brunswick Corp.)*	Multiple	Share	Standard
Anticoagulants (*Eisai v. Sanofi-Aventis)*	Single	Share	[1]
Cephalosporins(*SmithKline v. Eli Lilly)*	Multiple	Quantity	[1]
Microprocessors (three Intel cases)*	Multiple	Share	Standard
Hospital Services (*Cascade Health Solutions v. PeaceHealth)*	Multiple	Exclusive	[2]
Catheters (*Southeast Missouri Hospital v. C.R. Bard Inc.)*	Multiple	Share	[2]
Airline Reservations (two British Airlines cases)†	Single	Quantity	Standard
Mobile Phones (Korean Fair Trade Commission fine)‡	Multiple	Share	Standard
Empirical Research:			
Confections (Conlon and Mortimer (2015))	Multiple	Quantity	[3]
Video Rentals (Ho, Ho, and Mortimer (2012a), (2012b))	Multiple	Quantity	Standard
Video Games(Lee (2013))	Single	Exclusive	[4]
Mobile Phones (Sinkinson (2014))	Single	Exclusive	[5]
Beer (Sass (2005), Asker (2004) and (2005), Chen (2014))	Multiple	Share	Standard

"Product coverage" indicates whether the contract governs purchases of a single product or requires the purchase of multiple products. "Nature of the restriction" describes the condition that a downstream firm must meet to qualify for payment. "Share" indicates a market-share requirement, often referred to as a "Loyalty" contract; "Quantity" indicates a minimum (or maximum) quantity requirement, used in all-units discounts, full-line-forcing, or other contractual forms; "Exclusive" indicates exclusive dealing. "Downstream competition" is noted as "Standard" when downstream firms compete on price. Alternative forms of downstream competition vary by industry and are described as follows:

[1] Product administered to patients in hospitals. Insurers reimburse hospitals for a patient's treatment.

[2] Insurers reimburse hospitals for services associated with patient treatment.

[3] Retail prices rarely vary across products or time.

[4] Gaming consoles are durable; consumer demand responds to current and expected future prices.

[5] Service providers subsidize the purchase price of a handset when a consumer agrees to a two-year service plan.

* Cases are: *FTC v. Intel, AMD v. Intel,* and *Intel v. Commission.*

† Cases are: *Virgin Atlantic v. British Airlines* and *British Airlines v. Commission.*

‡ Fine levied against Qualcomm. See press release "Qualcomm's Abuse of Market Dominance," Korea Fair Trade Commission, July 23, 2009, available at http://eng.ftc.go.kr/bbs.do.

Cascade Health Solutions v. PeaceHealth (2007) was another case involving a bundled discount. McKenzie, the plaintiff, and PeaceHealth were the only providers of health care in Lane County, Oregon. McKenzie offered primary and secondary care, while PeaceHealth offered tertiary care as well. Furthermore, PeaceHealth offered insurers substantial discounts if they made PeaceHealth their sole provider of all three levels of health services. McKenzie alleged the bundled discount was exclusionary, but the Ninth Circuit ruled against it based on a price-cost test.

These cases were followed by others that were alternately decided on the basis of exclusion, or on the basis of predation, applying a price-cost test. *ZF Meritor v. Eaton*

Corp (2012) was a lawsuit brought against the dominant manufacturer of heavy-duty truck transmissions by a rival firm. The contention was that the long-term contracts that the defendant signed with the four major truck manufacturers amounted to de facto exclusive dealing. These contracts provided rebates to the truck manufacturers if they satisfied a high minimum-share purchase requirement, treated Eaton's products preferentially in their sales catalogs, and priced them lower than the plaintiff's products. The Third Circuit ruled against the defendant on the basis of exclusion.

The outcome was different in *Eisai v. Sanofi-Aventis (2014)*. In this case, the defendant offered hospitals a discount of up to 30percent on its anticoagulant drug Lovenox if they made 90 percent or more of their anticoagulant drug purchases from Sanofi. Eisai had exclusive distribution rights to Pfizer's competing product, Fragmin, and alleged that Sanofi's conduct amounted to de facto exclusive dealing. The district court reasoned that a price-cost test was appropriate in this case. As the test indicated that Sanofi did not price below cost, the court ruled in favor of the defendant.[2]

The discussions around court cases often revolve around the criteria by which conditional pricing practices are adjudicated. Specifically, the courts have not settled on whether such practices should be judged on the basis of exclusion or predation. While others have considered this question, we do not address it here.[3] Rather, we focus on academic work that studies the competitive effects of conditional pricing. We briefly discuss the relevant theory, and then delve into empirical analyses of the impact of conditional pricing practices on consumer welfare, industry profits, and firm behavior.

1 Theoretical Background

One of the reasons for the controversy surrounding conditional pricing practices is that economic theory gives an ambiguous answer about their impact on competition and welfare. Challenging earlier-held beliefs that vertical restraints have exclusionary effects, the Chicago Critique of Bork (1978) and Posner (1976) argued that such contracts may in fact enhance efficiency. The argument had two parts. First, because a rational downstream firm must be compensated for any exclusive arrangement, exclusion is observed only when it maximizes industry profits. Equivalently, only entrants that are less efficient than the incumbent can be excluded. Second, firms offer exclusive contracts to improve the efficiency of their operations. Some efficiency-inducing motivations include a desire to mitigate free riding by downstream firms[4] or to protect investments in specialized equipment.[5]

The Chicago view was in turn challenged by economists who used game-theoretic tools to model oligopolistic markets. Aghion and Bolton (1987) show that exclusive contracts with stipulated damage clauses between a buyer and an incumbent seller can lead to foreclosure of potential entrants. Using a slightly different approach, Rasmusen, Ramseyer, and

[2]These and other court cases are discussed at greater length in Sun (2015).
[3]For a discussion focusing on this topic see Klein and Lerner (2014).
[4]Marvel (1982).
[5]Klein (1988).

Wiley (1991) and Segal and Whinston (2000) show foreclosure is possible when there are externalities across buyers. Later work by Fumagalli and Motta (2006) demonstrates that exclusion of a more efficient rival can occur when downstream competition is weak, but not when competition is fierce.

Asker and Bar-Isaac (2014) and Chen and Shaffer (2014) study conditions under which a broader class of vertical contracting practices, including loyalty discounts and share-based contracts, can lead to foreclosure. Economic theorists also have developed models that study the effects of the quantity-based vertical rebates known as all-units discounts (AUDs). Kolay, Shaffer, and Ordover (2004) show that AUDs can arise even in the absence of an exclusionary motive and can be a more effective way to price discriminate than a menu of two-part tariffs. O'Brien (2013) demonstrates that AUDs can be efficiency-enhancing in the presence of both upstream and downstream moral hazard. Elhauge and Wickelgren (2015) explore the potential of loyalty contracts to soften competition, induce market segmentation, and deter entry.[6]

2 The Role of Empirical Analyses

In reality, any particular contractual arrangement may embody both efficiency-enhancing and foreclosure-inducing effects. Given the varied, and often opposing, predictions of different theoretical models, the burden to determine which effect dominates falls to empirical research. One potential source of information about the impact of conditional pricing practices is court-based evidence. Indeed, understanding previous litigation outcomes is important for forming expectations about the basis on which a court may decide to rule (e.g., exclusion versus predation). However, the challenge with drawing conclusions from litigated contracts is that they need not be representative of the wider class of contracts used in the economy. As Ippolito (1991) notes in her analysis of resale price maintenance, litigated cases are a selected sample of all pertinent disputes, and relying on them can lead to a biased assessment of the effects in which the researcher is interested. For this reason, independent empirical research is important for shedding light on the impact of these practices.

Empirical work on conditional pricing practices is scarce as researchers faces multiple challenges. First, data are often proprietary and difficult to obtain. Second, when data are available, lack of variation in prices and choice sets often hinders demand estimation. Third, supply-side estimation becomes problematic when agents' actions are endogenous or difficult to observe. Finally, the wide variety of contracts, together with the multiplicity of institutional setups, make it difficult to generalize results and extrapolate from one industry or type of contract to another.

Nevertheless, economists have made progress in assessing the effects of conditional pricing

[6] A related literature on vertical arrangements explores the competitive effects of the upfront payments that manufacturers make to retailers in exchange for shelf space. Shaffer (1991a) and Shaffer (1991b) develop theoretical models that analyze whether slotting allowances, resale price maintenance, and aggregate rebates facilitate collusion at the retail level. Sudhir and Rao (2006) empirically examine the efficiency and anticompetitive rationales for slotting allowances and find more evidence in favor of the former.

practices. Early work primarily consists of reduced-form analyses and informal discussions that link theory to observed behavior in different industries. More recently, researchers have developed and estimated structural models, which allow one to conduct counterfactual experiments and directly assess the impact of conditional pricing practices. Researchers who use a structural approach often must specify models of behavior for both firms and consumers. These demand and supply-side models are then interpreted as the true process by which data are generated. If the behavioral models are correct, the researcher can estimate parameters of the objective functions of firms and consumers that are robust to policy changes. Knowledge of these primitives allows the researcher to conduct counterfactual analyses; thus, one can change a particular feature of the world and predict what market outcomes will be. In contrast, the parameters estimated in reduced-form models may lack policy robustness and need not reveal anything about agents objective functions, ruling out the ability to explore counterfactual simulations.

3 Evidence from Reduced-form Analyses

We discuss one reduced-form study of loyalty contracts and four studies of exclusive dealing. Marìn and Sicotte (2003) use an event-study methodology to assess the impact of dual-rate loyalty contracts used by legal ocean shipping cartels. Using a series of judicial and legislative actions that questioned the legality of these contracts in the 1950s and early 1960s, they find that the stock prices of cartel members fell when the likelihood of the contracts being declared illegal increased. The authors interpret these findings as indicative of the value of the contracts to the ocean carriers. Furthermore, results show that stock prices of net exporters moved in a direction opposite to the stock prices of cartel members, suggesting that loyalty contracts enhanced market power but did not lead to efficiencies that were passed on to exporters.

Marvel (1982) and Grossman and Hart (1986) provide theoretical models of exclusive dealing and vertical ownership, respectively. Marvel discusses the use of two exclusive contracts; one litigated and one not. First, in the dress-pattern industry, he finds that Standard Fashions exclusive contracts, which were the point of contention in *Standard Fashion Co v. Magrane-Houston Co*, did not exclude rivals, but rather protected its investment in successful dress patterns from free riding by its dealers. Second, in the context of the insurance industry, Marvel concludes that insurance companies that rely heavily on advertising to retain clients use exclusive agents in order to protect their advertising investment. Grossman and Hart provide a slightly different but related view on the use of exclusive insurance agents. They argue that when firm actions are important for retaining customers, companies use exclusivity as protection against non-contractible actions by agents. However, if agent effort is more important for retaining customers, agents prefer to be independent to protect themselves against non-contractible actions by insurance companies.

Heide, Dutta, and Bergen (1998) look at exclusivity from a different angle. They use a survey of distribution managers to gain insight into what motivates the use of exclusive dealing. They find that a firm is more likely to sign exclusive contracts with its dealers if it

is concerned about free-riding, and less likely to do so if monitoring compliance is difficult or if exclusivity imposes substantial costs on end consumers. Interestingly, the survey indicates that the threat of competitive entry is not a motivating factor for the use of exclusive dealing.[7]

Sass (2005) takes a more direct look at the impact of exclusive dealing on market outcomes in the U.S. beer industry. Using reduced-form analyses, he finds that exclusive dealing tends to increase prices charged by brewers and distributors, and also total quantity sold. Furthermore, he finds no evidence that exclusivity increases the prices of rival brewers and distributors. Even though national advertising by brewers does not seem to affect the incidence of distributor exclusivity, the author interprets the overall results as more likely to be consistent with the efficiency-based motivation proposed by Marvel (1982), and inconsistent with the foreclosure explanation offered by Rasmusen, Ramseyer, and Wiley (1991) and the dampening-of-competition hypothesis proposed by Rey and Stiglitz (1995).

4 Evidence from Structural Analyses

We discuss studies of two conditional pricing practices: first, a vertical quantity-based rebate, also known as an all-units discount (AUD), and second, a vertical bundling contract, referred to as a full-line forcing (FLF) arrangement. However, similar to the reduced-form empirical evidence, many structural analyses examine exclusive dealing, and we also describe three analyses of exclusive dealing.

4.1 Confections

Conlon and Mortimer (2015) study the efficiency and foreclosure effects of an AUD used by the dominant firm in the vending channel of the confections industry. The main upstream players are Mars, Nestle, and Hershey. The dominant firm, Mars, offers a vending operator, Mark Vend, a discount that applies to all past and future units purchased in a given fiscal quarter. To qualify for the AUD, Mark Vend needs to meet a quantity threshold for purchases and a facings requirement, which specifies that the retailer should carry at least six Mars products in each vending machine.

These types of rebates can have both procompetitive and anticompetitive effects. On one hand, the AUD requirements can induce the retailer to restock its vending machines more frequently and reduce the likelihood of a stockout. This is efficient as it mitigates downstream moral hazard[8] and ensures customers can buy their top choice of candy. On the other hand, the AUD can lead to foreclosure of upstream competitors if the retailer chooses to carry Mars products at the expense of Hershey and Nestle products to satisfy the quantity and facings requirements.

[7]However, it is unclear whether company employees always answer such a question truthfully, given its potential legal implications.

[8]In this case, moral hazard occurs because the retailer does not have an incentive to exert the effort that the manufacturer finds optimal. For example, if one of the most popular Mars products, Snickers, is out of stock, consumers can switch to Reese's Peanut Butter Cups, a Hershey product. If the margin on Reese's is larger than the one on Snickers, this will leave the retailer better-off and Mars worse-off.

The first step in the analysis is to study the effect of effort on upstream and downstream profits. For this purpose, the article relies on a field experiment in which the vending operator removed the top-selling Mars products: Snickers, Peanut M&Ms, and both at the same time. This mimics the effect of reduced retailer effort because the most popular products are likely to go out of stock first. Studying which products consumers substitute to during the stockout, the authors estimate the impact of the product removal on manufacturer and retailer profits. They find that without accounting for the rebate approximately 90 percent of the lost profits induced by a stockout are borne by Mars. Once the rebate is taken into account, the manufacturer and downstream firm each bear about 50 percent of the cost of a stockout. This indicates that the AUD provides a powerful incentive for the retailer to exert more effort.

While the field experiment gives insight into the effect of the price-reducing aspect of the AUD, it does not allow one to analyze the impact of the quantity requirement. To this end, the authors estimate a structural model of consumer demand for different confection products, and a dynamic model of retailer effort provision and product selection. The estimated parameters enable them to conduct counterfactual analyses that indicate that AUDs have both efficiency and foreclosure effects.

The model of optimal retailer effort shows that the retailer is unlikely to exert the optimal level of effort (from Mars perspective) without an additional incentive, because restocking is costly. The level of effort with no AUD is as much as 11 percent lower than the effort that would be optimal if Mars operated the vending machines directly. Even though both the rebate and the quantity requirement of the AUD help to bridge the gap, it is the quantity threshold that provides the stronger incentive.

The model also reveals that the effort level that is optimal for Mars is higher than the effort level that would be optimal for the industry as a whole. As the vending operator restocks more frequently, fewer consumers are forced to substitute to Nestle and Hershey products. This leads to higher profits for Mars and lower profits for its competitors. Nestle and Hershey have no incentive to offer an efficiency-enhancing AUD of their own, which matches their behavior in the real world.

The article next considers the impact of the AUD on the retailers assortment choice. It finds that in the absence of the AUD the vending operator can increase its profits by substituting some Mars products for Hershey products. However, the risk of not meeting the requirements of the AUD induces the retailer to choose Mars products instead. The rebate on its own is not sufficient to do that. Rather, it is the quantity threshold and facings requirement that lead to this outcome. Furthermore, the benefits of the AUD are large enough that Hershey cannot undercut Mars and induce the retailer to carry its products unless it sells at a price that is below industry estimates of production cost. This result provides evidence that the AUD may induce some degree of foreclosure.

Since both efficiency and foreclosure effects are present, the authors then estimate the strength of each. The pure efficiency effect, ignoring the impact of the AUD on product assortment, is small - consumer surplus increases by about one percent while industry profits rise by even less. The benefit to consumers comes from better availability of top-choice

products, which leads to higher Mars profits and lower Nestle and Hershey profits.

Finally, to determine the overall welfare effect when both retailer effort and product choice are affected, the authors consider how upstream firms would act in the absence of the AUD. Allowing all three firms to act strategically is beyond the scope of the model, so they consider possible Mars actions, holding Nestle and Hershey wholesale prices fixed. If Mars does not optimize the wholesale price it offers, the retailer drops some Mars products and exerts a lower level of effort. This leads to lower industry profits and lower consumer welfare. If Mars re-optimizes its price, it undercuts Hershey so that the vending operator does not drop Mars products. The lower wholesale prices induce higher effort, which together with the product assortment raises consumer surplus. Total industry profits barely change, but the potential wholesale price cut benefits the retailer significantly.

4.2 Video Rentals

Full-line forcing contracts (FLFs) are another form of conditional pricing. Ho, Ho, and Mortimer (2012a) and Ho, Ho, and Mortimer (2012b) explore their use in the video rental industry and their implications. Under this type of pricing, upstream distributors sell tapes to rental stores at low per-unit prices on the condition that stores share a certain percentage of the revenue, satisfy a maximum and a minimum purchase requirement, and commit to purchasing all titles released by the distributor over a period of time.[9]

Ho, Ho, and Mortimer (2012b) estimates a flexible demand system and a model of retailers' portfolio and contract choices. The authors then use the estimated parameters to simulate the optimal decisions of distributors and retailers. The findings show that most distributors' real-world decisions on whether to offer FLF contracts are the profit-maximizing ones. Distributors that carry popular titles do not offer FLF contracts because their movies enjoy a high take-up rate in any case. However, weaker distributors benefit from FLF contracts as rental stores purchase more of their titles.

Ho, Ho, and Mortimer (2012a) builds on the work done in Ho, Ho, and Mortimer (2012b) to examine the competitive and welfare implications of FLF contracts. The authors identify three potential effects. An efficiency effect occurs when a FLF contract allows a rental store to keep a higher level of inventory of a given title, increasing its availability to consumers. A market coverage effect is observed when a store signs a FLF contract with a distributor and carries more titles from that distributor than it would otherwise. Finally, a leverage effect is present if a rental store drops titles from one distributor when it enters into a FLF contract with another.

Using the parameter estimates of the structural model, the authors quantify the importance and direction of each effect and the impact on welfare. First, the results indicate that the leverage effect is negligible - positive for some distributors and negative for others. While

[9]This makes FLFs similar to another contract under which distributors sell tapes - revenue sharing (RS). The difference between the two is that RS does not require the store to buy all titles released by the distributor, but offers less generous per-tape prices and revenue sharing terms. The other type of contract that distributors offer is linear pricing (LP), which charges a higher per-tape price, but does not come with the requirements characteristic of RS and FLF contracts.

one might expect the leverage effect to be positive because of the costs of holding inventory that rental stores face, the evidence is more consistent with the hypothesis that stores use the savings generated by the advantageous FLF terms to purchase additional titles from other distributors. Second, the market coverage effect is substantial. The bundling aspect of the contract induces stores to carry more movies by an FLF distributor than they would otherwise. Combined with the small leverage effect, this indicates that FLF contracts increase the title assortment available to consumers. Third, the analysis also finds that there is a positive efficiency effect, which is driven by the fact that lower upfront prices per tape paid by stores ameliorate a double marginalization problem. It is important to note that a revenue sharing contract would not have the same impact because rental stores choose to purchase popular titles on linear pricing contracts to avoid sharing the revenue. The substantial efficiency effect occurs when a store takes all distributor titles under a FLF contract and purchases a large inventory of them in response to the low upfront prices. The positive effect on product assortment and availability imply that FLFs increase consumer surplus.

4.3 Video Games and Consoles

Exclusive arrangements can be thought of as an extreme form of conditional pricing in which one of parties to the contract agrees to transact only with the other one. Lee (2013) studies vertical integration and exclusive contracts in the video game industry. The industry is comprised of console manufacturers, who produce the platform needed to play games, developers, who create games, and publishers, who bring games to market. The platform makers sometimes integrate all three tiers. Games produced by such entities are called "first-party" titles and are exclusive to the given platform. Independent software developers produce "third-party" titles. They have the choice to make a game exclusive, available only to consumers that own a particular console, or to "multihome," making a title available on multiple platforms. Even though multihoming provides the benefit of an expanded audience, it imposes non-trivial "porting" costs on the developer.

Lee focuses specifically on the sixth generation of the video game industry, covering the period from 2000 to 2005. In October 2000, Sony released PlayStation 2 (PS2), the first sixth-generation console and the successor to the highly successful PlayStation. One year later[10] Nintendo and Microsoft entered the market with their own platforms Game Cube (GC) and Xbox (XB). This setting allows the author to empirically analyze the possible pro- and anticompetitive effects of exclusive dealing. In the context of the video game industry, exclusivity can limit consumer choice and lead to entry deterrence and rival foreclosure, concerns exacerbated by the presence of network externalities. However, it can also encourage investment, solve coordination problems characteristic to two-sided markets, and help entrants gain a foothold in an established industry.

The author estimates a model of dynamic consumer demand for both video games and consoles, which takes into account the fact that consumers are forward-looking and platforms are durable goods, and a model of hardware adoption by software developers who weigh the

[10]Over that year Sony sold 5 million PS2 consoles.

costs and benefits of exclusivity and multihoming. Modeling both sides of the market allows agents to react to past and future actions of other agents, which is an important feature of consumer and firm behavior in reality. Based on these models, the author analyzes what market outcomes would have been in the absence of exclusive arrangements. The counterfactuals indicate that a ban on exclusives benefits the incumbent firm at the expense of entrants, while also increasing consumer surplus. Total hardware sales increase by seven percent, driven by higher PS2 and lower GC and XB sales. At the same time, software sales rise by 58 percent as PS2 owners purchase popular titles that were previously available only on GC and XB. The newly-acquired access to previously unavailable games is the main determinant of the $1.5 billion increase in consumer welfare.

Two facts are driving the counterfactual results. First, as the incumbent, PS2 has a larger installed base that attracts developers who want to reach a wider audience. Second, in the real world, GC and XB have a higher-quality stock of exclusive titles than PS2. In response to the ban on exclusives, these high-quality titles become available on PS2 and as a result the entrant platforms can no longer differentiate themselves sufficiently from the incumbent. The response of consumers who previously owned GC and XB because of the exclusive titles is to switch to PS2.

The author points out that the counterfactual analysis is "partial," which means that the quality and set of products are kept fixed, and that platform manufacturers are not strategic (i.e. they offer the same contracts to all developers, and do not adjust the price of their consoles). One can argue that the less vigorous competition in the counterfactual scenario might lead the incumbent to raise its prices and decrease investment in first-party titles, decreasing their quality. Modeling all these decisions is computationally infeasible, but the author offers a set of robustness checks. He varies the price of consoles, the quality of first-party titles, and porting costs and re-runs the counterfactual analysis. The results indicate that the prohibition of exclusives is still detrimental to entrants and beneficial to consumers, although consumer welfare gains are substantially diminished in some cases.[11]

4.4 Mobile Phones

Sinkinson (2014) provides another inquiry into the competitive effects of exclusive contracts. The focus of his study is on the contract between AT&T and Apple for the exclusivity of the first-generation iPhone, which attracted a lot of attention when it was announced in 2007. Opponents of the deal were concerned that it would lead to higher prices and limited choice for consumers, while proponents claimed that it would encourage wireless carriers to innovate.

The author builds on Rey and Stiglitz (1995) to create a model in which exclusivity allows a carrier to differentiate the handset-network bundles it offers consumers not only through quality of service (on the network) but also through product variety (in handsets). This additional differentiation may allow a carrier to charge a higher markup. Furthermore,

[11] In particular, consumer welfare gains fall by 80% when first-party title quality decreases in response to the ban on exclusivity.

if prices are strategic complements,[12] the higher price on the differentiated bundle leads to higher prices on all other bundles in equilibrium. This effect is known as "softening of price competition." If the demand for handsets is less sensitive to price than the demand for wireless service, softened price competition for wireless service can increase a carrier's profits to such an extent that it can compensate the handset manufacturer for the foregone opportunity to sell to other wireless carriers.

To measure the effects of exclusivity, the author estimates a model of consumer demand for smartphone-carrier bundles that accounts for the durable nature of the handset and the fact that it is sold on a two-year service contract. He then simulates multiple counterfactual scenarios. The first analysis calculates AT&T's and Verizon's willingness to pay for exclusivity by comparing their profits in cases where each firm does and alternatively does not obtain exclusive rights to the iPhone. The outcome is that AT&T has higher willingness to pay only after equilibrium price adjustments are allowed to occur, which underscores the importance of modeling the equilibrium price changes. The results are driven by the fact that AT&T offers lower quality service than Verizon and without the iPhone it attracts fewer customers and has to cut its prices. At the same time, Verizon's higher quality network insulates it from price competition and makes it less dependent on the iPhone in the counterfactual.

An alternative scenario, in which the iPhone is available on all carriers, reveals that manufacturers of Android-based smartphones make approximately $1.4 billion less in profits. This demonstrates that the exclusive contract between AT&T and Apple created strong incentives for entry into the smartphone market. The article does not estimate the welfare effect of exclusivity because this requires a model of the change in the likelihood of entry brought about by the exclusive contract. However, there is evidence of both softening of price competition, which hurts consumers in a static context, and increased entry incentives, which benefits consumers in a dynamic setting.

4.5 Beer

Asker (2004) and Asker (2005) study the effects of exclusive dealing in the context of the beer industry in the Greater Chicago area. The market is characterized by a three-tier vertical structure composed of brewers, distributors, and retailers. Some of the largest brewers, such as Anheuser-Busch and Miller, enter into exclusive agreements with their distributors, which raises concerns about possible foreclosure of rival brewers.

The author estimates a structural model of consumer demand for beer, and a supply-side model of brewer profit maximization, in which the brewer sets the prices charged to both the distributor and the retailer. Combining the two models, Asker calculates brewer and distributor marginal costs. He documents that brewers that use exclusive dealing enjoy a cost advantage over their rivals. He also proposes a method, developed in Asker (2005), to test whether this cost advantage results from competitors being foreclosed from low-cost distributors. The idea is that if distributor costs are randomly distributed across markets,

[12] In game theory, players' actions (usually choice of price or quantity) are strategic complements if an increase by one player leads the other players to increase their strategic variable as well.

and if exclusivity leads to foreclosure, then the distribution of distributor costs for brewers that never use exclusive dealing will be truncated from the left. This will not be the case if the cost advantage stems from investments that brewers make into their relationships with their exclusive distributors. The test indicates no evidence of foreclosure.

Asker (2004) then conducts two counterfactual analyses in which exclusive dealing is banned. In the first, the cost advantage from using exclusive dealers is attributed entirely to additional investment in the distributor by the brewer. A ban on exclusives in such a case eliminates the cost benefits and leads to a 20 percent decrease in consumer welfare, retailer profits, and total brewer profits. In the second counterfactual, the cost advantage is attributed entirely to foreclosure. Removing exclusive dealing leads to lower costs for all brewers, increasing consumer surplus, retailer, and brewer profits by 40 percent. The results indicate the potential benefits that an intervention by the antitrust authority can bring if foreclosure is present. Given that the test results provide no support to the foreclosure hypothesis, however, the author concludes that the most likely outcome of an intervention is a welfare loss.

Chen (2014) provides further insights into the impact of exclusive dealing on the beer industry. In particular, the author examines the effect of Anheuser-Busch's exclusive arrangements with its distributors on rivals' entry decisions in the California market. California is particularly suitable for the study because many microbreweries enter the market and compete with the large national players (Anheuser-Busch, Miller, and Coors).

To analyze the effect of exclusive dealing, the author first estimates a model of consumer demand for beer. She then combines these estimates with a model of a microbrewer's decision to enter a market, which depends on expected demand for its product and on the entry decisions of other microbrewers. The consumer demand and brewer entry models allow her to recover the impact of exclusivity on the fixed cost and probability of entry. The results highlight two facts. First, modeling the interdependence of firms' entry decision is important. It turns out that there are substantial spillover effects of entry into a market: the more microbrewers there are in a market, the easier it is for others to enter. Modeling strategic interaction is also important because it affects the estimates of the impact of Anheuser-Busch's exclusive arrangements. If strategic interactions are not taken into consideration, the paper finds that there is no foreclosure effect of exclusivity. If such interactions are allowed, the results show a more nuanced picture: foreclosure is present in some rural areas, but not in other locations. Where a foreclosure effect is present, exclusivity decreases the probability of a specialty beer producer's entry by six percentage points - a substantial effect given that the base entry probability is 28 percent.

Despite the finding of foreclosure in some areas, the author concludes that foreclosing rivals is not the main motivation behind the use of exclusive distributors. Counterfactual simulations show that banning exclusivity does not have a big impact on entry behavior as at most one additional brewer enters a market. Furthermore, the consumer welfare benefit of the expanded choice set is negligible. The overall results support the notion that exclusive dealing in the beer industry is primarily efficiency-inducing, in line with the conclusion reached in Asker (2004), Asker (2005), and Sass (2005).

5 Conclusion

Despite significant challenges, economists have made substantial progress in the empirical investigation of the effects of conditional pricing practices. There are common threads that connect the reviewed articles. From a methodological point of view, these articles underscore the importance and difficulty of careful demand and supply estimation. Estimating demand is particularly challenging when goods are durable and consumers are forward-looking. The same is true for supply estimation when firm actions are unobserved. Furthermore, even the most elaborate models cannot incorporate all possible strategic actions by agents, as they quickly become computationally infeasible. The researcher must exercise judgment and model the most important features of an industry to deliver the clearest insight into the phenomenon of interest.

The other common thread is that conditional pricing practices rarely have a single effect. In the confections market, an all-units discount encourages downstream effort, but simultaneously raises the possibility that upstream rivals may be foreclosed. The estimated combined impact, however, is to raise consumer welfare and industry profits. In the video rental market, full-line forcing contracts are offered by producers who benefit from their use, and not by producers who do not. On balance, the use of the contracts is estimated to benefit consumers through better assortment and availability of titles. In the video game industry, exclusivity is estimated to lower consumer surplus while helping entrants establish themselves on the market. In the smartphone industry, exclusive contracts can lead to higher prices, but can also generate substantial entry incentives. Finally, three different authors find evidence that the use of exclusive dealing in the beer industry is likely driven by efficiency motivations, with limited evidence of foreclosure. All of these results demonstrate that the pro- and anticompetitive effects of conditional pricing practices exist simultaneously and must be carefully analyzed in different contexts.

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