DEFINING ANTITRUST MARKETS WHEN FIRMS OPERATE TWO-SIDED PLATFORMS

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I.   INTRODUCTION

Two-sided platforms (2SPs) cater to two or more distinct groups of customers. As we will explore, members of one customer group need members of the other group for a variety of reasons. The platform helps these customers get together in many ways and thereby creates value for these customers that they could not readily obtain without the coordination that the platform provides. The village market is one of the oldest examples of a 2SP. It is a place where buyers and sellers can get together and trade. A modern example is eBay. The village matchmaker is another old example. She tries to find marriage partners for men and women.   A modern example is 8MinuteDating, which organizes speed dating events where men and women meet for short periods of time and decide whether they would like to see each other again.[1] Today, 2SPs are the dominant form of business organization in a wide variety of industries, including many economically significant ones. Well-known examples are American Express (travelers' checks and charge cards), Google (search engine-based portal), the New York Stock Exchange (buyers and sellers), and Microsoft (software platforms).

Economists have shown that the economic principles that govern the diverse industries based on 2SPs differ from those that govern traditional industries in several important ways.[2] First, profit-maximizing prices may require charging one side less than the marginal cost of serving that side. Empirical surveys of industries based on 2SPs find many examples of prices that are low or even negative so that customers on one side are incentivized to participate in the platform.[3] Most malls do not make shoppers pay to enter,

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[1] 8 Minute Dating, http://www.8minutedating.com/.

[2] *See, e.g*, Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 J. EUR. ECON. ASS'N, 990 (2003); Mark Armstrong, *Competition in Two-Sided Markets* (Indus. Org. Econ., Working Paper No. 0505009, 2005).

[3] David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. ON REG. 325 (2003) [hereinafter *Evans I*]; David S.

and they sometimes offer negative prices—through inducements such as free parking and entertainment—to subsidize shoppers' participation in the platform.[4]   More generally, 2SPs form systems in which there are feedback effects between the customer groups. Changes that affect the first customer group necessarily affect the second customer group and, in turn, affect the first customer group, and so on. For example, a recent effort in Australia to place a cap on the fees charged by credit card systems to merchants has resulted in an increase in annual fees (paid by consumers) for credit cards.[5]

Many antitrust cases have involved 2SPs. A few—including several important ones—seem to have touched on two-sided issues before economists did.[6] Notwithstanding whether the courts held correctly or not, their analyses of these markets and practices are not analytically correct in light of the recent 2SP literature.[7]   Table 1 presents an overview of antitrust cases in the European Community and the United States that concern 2SPs. We have not done a systematic review of cases, but rather have listed cases that have had high profiles in these jurisdictions and with which we are generally familiar. The cases span all of the major categories of 2SPs and involve the full spectrum of competition policy issues.

Table 1. Summary of Leading Cases by 2SP Type

Evans, *Some Empirical Aspects of Multi-Sided Platform Industries*, 2 REV. OF NETWORK ECON. 191 (2003) [hereinafter *Evans II*].

   [4] *Evans I*, *supra* note 3; *Evans II*, *supra* note 3.

   [5] *See* Howard H. Chang, et al., *The Effect of Regulatory Intervention in Two-Sided Markets: An Assessment of Interchange-Fee Capping in Australia*, REV. OF NETWORK ECON. (forthcoming), *available at* http://ssrn.com/abstract=820044.

   [6] Nat'l Bancard Corp. v. Visa U.S.A*.,* 779 F.2d 592, 602 (11th Cir. 1986); Times-Picayune Pub. Co. v. United States, 345 U.S. 594, 610 (1953); Joined Cases C-241/91 P & C-242/91 P ("Magill cases"), RTE & ITP v. Comm'n of the Eur. Cmtys. 1995 E.C.R. I-743.

   [7] *Times-Picayune Pub. Co.*, 345 U.S. at 610; *Nat'l Bancard Corp.*, 779 F.2d at 602.

	Case	Case Type		Case	Case Type
Media	Times Picayune	Monopolization	**Transaction Systems**	NaBanco	Cartel
	Magill	Refusal to supply			
	BT Yellow Pages	Monopolization			
	Lorain Journal	Exclusive dealing		Wal-Mart	Tying
Exchanges	Sotheby's-Christies	Cartel	**Software Platforms**	Microsoft-Browser	Monopolization, Tying
	Marsh McLennan	Cartel		Microsoft-Media Player	Tying
	London Stock Exchange	Merger		Nintendo	Exclusivity
	Mobile operators	Excessive Pricing			

The antitrust issues that can arise for 2SPs are similar to those for traditional businesses. Members of these platforms can conspire to fix prices, to acquire market power through mergers, and attempt to obtain or to perpetuate monopoly power through the usual panoply of unilateral practices. However, the standard tools of analysis may need to be modified to fit these 2SP businesses. For example, there is no reason to presume for 2SPs that pricing below average variable cost indicates predatory pricing because such below-cost pricing is endemic to 2SPs regardless of competitive conditions.[8] To take another example, in order to increase their profits through price fixing, competing 2SPs would have to fix prices to both customer groups. Otherwise they would shift the profits from customers on the side of lower,

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[8] *Evans I, supra* note 3, at 46-47; Rochet & Tirole, *supra* note 2, at 991; Julian Wright, *One-Sided Logic in Two-Sided Markets*, 3 REV. OF NETWORK ECON. 44, 44-64 (2004).

fixed prices to customers on the other side, whose prices have not been fixed.[9]

This Article focuses on defining relevant markets and assessing market power when the subjects of the antitrust analysis include 2SPs.   The fact that 2SPs compete simultaneously for two distinct customer groups has three ramifications.   First, focusing on one dimension of this competition tends to distort the competition that actually exists among firms. An extreme case concerns heterosexual dating services.   They compete for men and women customers, but it does not make sense to talk about separate markets for men and women. Second, market definition is supposed to identify the constraints on pricing and other business decisions.   Changing the price for one set of customers affects the demand of the other set of customers, which in turn has a feedback effect on the demand from the first set of customers. The interdependencies between the two customer groups may provide an economically important constraint, yet this is ultimately an empirical issue. Third, the possibility of obtaining supracompetitive profits through certain business actions depends on the relationship between the two sides due to their interlinked demand and the nature of the competition on both sides. Profits on one side can be dissipated on the other side.   That possibility affects the analysis of incentives and the sorts of anticompetitive practices that make business sense.

It is helpful to begin by clarifying a few terms that we will use throughout this Article and also to note some differences in how these terms are used occasionally in the literature. Many scholarly articles by economists refer to "two-sided markets." That term is sometimes applied to businesses that are 2SPs and sometimes to the markets in which they

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[9] For examples of price fixing allegations concerning 2SPs, see the complaint in New York v. Marsh & McLennan Co., No. 04403342 (filed in 2004),   *available*   *at* http://www.oag.state.ny.us/press/2004/oct/oct14a_04_attach1.pdf; Douglas Frantz et al., *Ex-Leaders of 2 Auction Giants Are Said to Initiate Price-Fixing*, N.Y. TIMES, Apr. 7, 2000, at A1.

operate.[10] Here, we use the term 2SP to refer to the entity—the business, cooperative, standard, or government entity—that provides a physical or virtual platform for distinct customer groups. 2SPs compete in what we will call 2SP industries. Thus, dating clubs are platforms that compete in the matchmaking industry. We try to avoid the term "two-sided market" because the word "market" is a term of art for competition policy.

Although, for the most part, we will use the term "two-sided platform," the reader should note that some platforms have more than two distinct groups of customers. Software platforms, such as Microsoft's Windows, have at least three: hardware manufacturers; application developers; and end users. 2SPs are a special case of nSPs where *n>1*. As most familiar platforms are two-sided, we stick with this case to simplify the exposition.

In the next section, we provide an introduction to 2SPs and discuss some of the most prominent examples. Section III reviews some basic economic principles about pricing and other decisions for 2SPs. Section IV then considers the factors that are important in determining the industrial organization of 2SPs. Next, Sections V and VI analyze market power and market definition for 2SPs and explain the issues that differ from the single-sided analysis. The final section offers our concluding thoughts.

II. ECONOMIC BACKGROUND ON 2SPS

A heterosexual singles-oriented club offers some intuition on the economics of 2SPs. A nightclub, such as Bungalow 8 in Manhattan, provides a platform where men and women can meet, interact, and search for potential dates. The club must have two groups of customers on board its platform to have a service to offer either one: it needs to get men and women to come. Moreover, the proportion of men and women matters. A singles club with few women will not

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[10] Rochet & Tirole, *supra* note 2, at 997 (citing to those papers for general discussion of two-sided markets).

attract men, and a club with few men will not attract women. Pricing is one way to adjust the balance. The club might want to offer women a break if they are in short supply (through a lower price or free drinks). Or, it might want to ration the spots to ensure the appropriate number of women; popular clubs typically have queues waiting outside, and women are picked out of line disproportionately.

The dating club represents a platform according to the informal definition that we introduced at the start. There are two groups of customers: men and women. Members of each group value members of the other group, and the platform provides a way for them to get together.

Rochet and Tirole (2004) have proposed a formal definition[11]:

> A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount; in other words, the price structure matters, and platforms must design it so as to bring both sides on board.[12]

In order to satisfy this definition, "the relationship between end-users must be fraught with residual externalities" that customers cannot sort out for themselves.[13] That is clear in the case of the dating environment.

Men and women want the ability to search for dates among a large number of opposites. It is hard to conceive of a practical mechanism for women to reward men who come to a singles club but whom they ultimately reject. In the other 2SP industries we consider, it is difficult if not

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[11] Note that the word "market" above is being used in the loose manner that is the custom among economists.

[12] Jean-Charles Rochet & Jean Tirole, *Two-Sided Markets: An Overview* 40 (IDEI-CEPR conference on Two-Sided Markets, Working Paper, 2004), *available at* http://idei.fr/doc/by/tirole/rochet_tirole.pdf.

[13] As a result, a necessary condition for a market to be two-sided is that the Coase theorem does not apply to the transaction between the two sides. *See id.* at 13-14.

impossible to imagine customers on one side of the platform making side payments to customers on the other side. As a result, the platform owner can institute a pricing structure to harness indirect network effects, and it is not feasible for customers to defeat this pricing structure through arbitrage.

It is helpful to distinguish four different types of 2SPs, although the boundaries between the types can be fuzzy: exchanges, advertiser-supported media, transaction devices, and software platforms.[14]

A. Exchanges

Exchanges have two groups of customers who can generally be considered "buyers" and "sellers."[15] The exchange helps buyers and sellers search for feasible contracts—that is, where the buyer and seller could enter into a mutually advantageous trade and for the best prices. In these situations, the buyer pays as little as possible, and the seller receives as much as possible.[16] It covers various matchmakers, such as dating services and employment agencies. It also covers traditional exchanges: auction houses; Internet sites for business-to-business, person-to-business, and person-to-person transactions; various kinds of brokers (insurance and real estate); and financial exchanges for bonds and equity. Finally, exchanges include a variety of

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[14] *See* David Evans et al., *A Survey of the Economic Role of Software Platforms in Computer-Based Industries,* INDUSTRIAL ORGANIZATION AND THE DIGITAL ECONOMY (G. Illing & M. Peitz eds., MIT Press) (forthcoming). In that paper, the authors refer to software platforms more generally as shared input facilities. Armstrong, *supra* note 2, uses the term "competitive bottlenecks" to refer to certain shared-input facilities. Although his discussion is analytically sound, his term is pejorative and has a meaning in competition law that differs from the one he assigns to it.

[15] This Article will employ the terms "buyers" and "sellers" loosely.

[16] Some securities exchanges, such as the New York Stock Exchange, also need to attract middlemen—specialists or market makers—who quote prices to both buyers and sellers and bring liquidity to the market. *See* FREDERIC S. MISHKIN & STANLEY G. EAKINS, FINANCIAL MARKETS AND INSTITUTIONS 17 (Addison-Wesley 2d ed. 1998).

businesses that provide brokerage services, e.g., publishers (readers and authors), literary agents (authors and publishers), travel services (travelers and travel-related businesses), and ticket services (people who go to events and people who sponsor events).

Exchanges provide participants with the ability to search among participants on the other side and the opportunity to consummate matches. Having large numbers of participants on both sides increases the probability that participants will find a match. Depending on the type of exchange, however, a larger number of participants can lead to congestion. This is the case with physical platforms, such as singles clubs or trading floors. Moreover, participants may derive some value from having the exchange prescreen participants to increase the likelihood and quality of matches.

Some exchanges charge only one side. For example, only sellers pay directly for the services that eBay provides.[17] This is also true for real estate sales in the United States: the seller pays. Other exchanges charge both sides, although the prices may bear little relation to side-specific marginal costs. For instance, Internet matchmaking services charge everyone the same, while, as we mentioned, physical dating environs sometimes charge men more than women. Auction houses charge commissions to buyers and sellers. Until the recent settlements in the United States, insurance brokers charged both insurance customers and insurance providers.[18]

B. Advertising-Supported Media

Advertising-supported media, such as magazines, newspapers, free television, and web portals, are based on a two-sided business model. The platform either creates content (newspapers) or buys content from others (free television). The content is used to attract viewers. The viewers are then used to attract advertisers. There is a clear

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[17] *See, e.g.*, eBay.com Fees, http://pages.ebay.com/help/sell/fees.html.

[18] See the complaint filed in New York v. Marsh & McLennan Co., No. 04403342 (filed Oct. 14, 2004), *available at* http://www.oag.state.ny.us/press/2004/oct/oct14a_04_attach1.pdf.

indirect network effect between advertisers and viewers. Advertisers value platforms that have more viewers. The extent to which viewers value advertisers remains a subject of debate, but we suspect that viewers value advertisers more than they might admit.[19]

Most advertising-supported media businesses earn much of their revenues—and probably their entire gross margin—from advertisers.[20] Print media is often provided to readers at something close to or below the marginal cost of printing and distribution. In some cases, such as yellow page directories and some newspapers, they are provided for free. Most web portals, e.g., Google and Yahoo, receive revenue only from advertisers.

C. Transaction Systems

Particular methods of payment only work if buyers and sellers are willing to use them. Humans switched from a barter system when they agreed on a standard metric for exchange, such as metallic coins or seashells. Governments facilitated this switch by ensuring the integrity of coins (to various degrees) and by using government-issued coinage for buying and selling. Cash, which has no intrinsic value in most modern economies, provides a payment platform

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[19] *See, e.g.,* Roger D. Blair & Richard E. Romano, *Pricing Decisions of the Newspaper Monopolist*, 59 S. ECON. J. 721, 731 (1993) (suggesting that "circulation demand rises with increases in the quantity of advertising"); James M. Ferguson, *Daily Newspaper Advertising Rates, Local Media Cross-Ownership, Newspaper Chains, and Media Competition*, 26 J.L. & ECON. 635, 653 (1983). Other studies have shown that, unlike Americans, readers in certain European countries are averse to advertising. *See, e.g.,* Nathalie Sonnac, *Readers' Attitudes Toward Press Advertising: Are They Ad-Lovers or Ad-Averse?*, 13 J. MEDIA ECON. 249 (2000). On the other hand, TiVo and other related products that permit ad avoidance and deletion are currently very popular, as one study cites that TiVo viewers skip about 60% of commercials. *See A Farewell to Ads?*, ECONOMIST, Apr. 15, 2004, *available at* http://www.economist.com/business/displayStory.cfm?story_id=2598890.

[20] Lisa George & Joel Waldfogel, *Who Benefits Whom in Daily Newspaper Markets?* 11 (Nat'l Bureau of Econ. Research, Working Paper No. 7944, 2000).

because buyers and sellers expect that other buyers and sellers will use it. Of course, the government facilitates these exchanges with various laws and through its own buying and selling activities.

For-profit transaction systems are based on the same principles, although they have challenges that governments—which can create a platform by fiat—do not necessarily have.[21] Although bank checks and travelers' checks illustrate examples of for-profit transaction systems, we focus on payment cards, which have been the subject of significant competition policy scrutiny in many countries.

Diners Club started the first two-sided payment system in 1950.[22] Before then, stores issued payment cards to their customers for use only at their stores.[23] Diners Club began by getting a set of restaurants to agree to take its card for payment; that is, Diners Club would reimburse the restaurant for the meal tab and then in turn to collect the money from the cardholder.[24] It also persuaded individuals to take its card and use it for payment. Starting with a small base in Manhattan, it grew quickly throughout the United States and other countries.[25]

Diners Club charged restaurants seven percent of the meal tab. Cardholders had to pay an annual fee, which was offset in part by the float they received as a result of having to pay their bills only once a month. As a result, Diners Club earned most of its revenue—and most likely all of its gross margin—from merchants. Other entrants into the charge and debit card businesses have followed this same approach.[26] Determining who subsidizes the credit card system is a bit more complicated because the product bundles a transaction feature (for which the cardholder pays

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[21] DAVID S. EVANS & RICHARD SCHMALENSEE, PAYING WITH PLASTIC 1149-62 (MIT Press 2005).

[22] *Id.* at 4.

[23] *Id.* at 53.

[24] *Id.* at 54.

[25] *Id.*

[26] *Id.* at 54-55.

little) and a borrowing feature (for which the cardholder incurs finance charges). However, it is safe to say that merchants are the main source of revenue for credit cards held by people who do not revolve balances.[27]

American Express, Discover, and Diners Club (until its recent absorption into MasterCard) set prices for merchants, including the merchant discount, which gives rise to a positive variable transaction price, and for cardholders, such as annual fees and various rewards which may give rise to negative variable transaction prices.[28] Card associations, such as MasterCard and Visa, are examples of cooperative 2SPs. To consummate a transaction, the parties must agree on the division of profits and the allocation of various risks between the entity that services the merchant and the entity that services the cardholder. Most card associations set this centrally as, in effect, a standard contract between the businesses that service the two sides. Typically, they agree that the entity that services the merchant pays a percentage of the transaction—the "interchange fee"—to the entity that services the cardholder.[29] This fee ultimately determines the relative prices for cardholders (issuers obtain a revenue stream which they compete) and merchants (acquirers pass the cost of the interchange fee onto merchants). As we discuss below, this centrally set fee has been the subject of litigation and regulatory scrutiny.[30]

D. Software Platforms

A software platform provides services for applications developers. These services help developers obtain access to the hardware for the computing device in question, as well as, other helpful services. Users can run these applications only if they have the same software platform as that relied on by the developers. Developers can sell their applications

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[27] Evans I, *supra* note 3, at 345.

[28] EVANS & SCHMALENSEE, *supra* note 21, at 150-52.

[29] EVANS & SCHMALENSEE, *supra* note 21, at 11.

[30] EVANS & SCHMALENSEE, *supra* note 21, at 285-86.

only to users that have the same software platform that they used to write their applications.

Software platforms are central to several important industries, including personal computers (e.g., Apple, Microsoft), personal digital assistants (e.g., Palm, Treo), 2.5G+ mobile telephones (e.g., Vodafone, DoCoMo), video games (e.g., Sony PlayStation, Xbox), and digital music systems (e.g., QuickTime/iTunes, MusicMatch, RealPlayer, and Windows MediaPlayer). With the exception of video games, software platform owners make most of their revenue, and their entire gross margin, from the user side.[31] Developers generally obtain access to platform services for free, and they acquire various software products that facilitate writing applications at relatively low prices. Video game console manufacturers, on the other hand, typically receive most of their gross margin from licensing access to their software and hardware platforms to game developers. They sell the video game console at close to or below manufacturing cost.

III. ECONOMIC PRINCIPLES

The body of theoretical economics literature on 2SPs is relatively new. Economists have used stylized models to derive results that apply to some of the industries described above.[32] The precise results are sensitive to assumptions

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[31] 1994 WORLDWIDE SOFTWARE REVIEW AND FORECAST, IDC Market Analysis No. 9,358 (Nov. 1994); 1995 WORLDWIDE SOFTWARE REVIEW AND FORECAST, IDC Market Analysis No. 10,460 (Nov. 1995); 1996 WORLDWIDE SOFTWARE REVIEW AND FORECAST, IDC Market Analysis No. 12,408 (Nov. 1996); 1997 WORLDWIDE SOFTWARE REVIEW AND FORECAST, IDC Market Analysis No. 14,327 (Oct. 1997); 1999 WORLDWIDE SOFTWARE REVIEW AND FORECAST, IDC Market Analysis No. 20,161 (Oct. 1999); WORLDWIDE SOFTWARE REVIEW AND FORECAST, 2001-2005, IDC Market Analysis No. 25,569 (Sept. 2001).

[32] For examples of models of the payment card and telecommunications industries, see Jean-Charles Rochet & Jean Tirole, *Cooperation Among Competitors: Some Economics of Payment Card Associations*, 33 RAND J. ECON 549 (2002); Julian Wright, *Optimal Card Payment Systems*, 47 EUR. ECON. REV. 587 (2003); Julian Wright, *Access*

about the economic relationships among the various industry participants. Even for these special cases, it remains difficult to obtain results without making further assumptions about the precise nature of the relationships among demand, cost, and indirect network effects.[33] Nevertheless, several principles have emerged from this literature that seem to be robust. They appear to rely on a few assumptions: the platform has two groups of customers; there are indirect network externalities; and customers cannot resolve these externalities themselves.

A. Pricing

To see the intuition behind pricing, consider a platform that serves two customer groups, *A* and *B*. It has already established prices for both groups and is considering changing them.[34] If it raises the price for members of group *A*, then fewer *A*s will join. If nothing else changed, the relationship between price and the number of *A*s would depend on the price elasticity of demand for *A*s. Because members of group *B* value the platform more if there are more *A*s, fewer *B*s will join the platform at the current price for *B*s. That drop off depends on the indirect network externality that is measured by the value that *B*s place on *A*s. But with fewer *B*s on the platform, *A*s also value the platform less, leading to a further decline in their demand. Thus, there is a feedback loop between the two sides: The effect of an increase in price on one side results in a decrease

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Pricing Under Competition: An Application to Cellular Networks, 50(3) J. INDUS. ECON. 289 (2002).

[33] That is, the models are based on assuming particular functional forms—e.g., linear—for relationships. Rochet & Tirole, *supra* note 2, at 993; Julian Wright, *The Determinants of Optimal Interchange Fees in Payment Systems*, 52(1) J. INDUS. ECON. 295-96 (2004).

[34] To keep matters simple, we consider the case where each side is charged a membership fee. *See* Mark Armstrong & Julian Wright, *Two-Sided Markets, Competitive Bottlenecks and Exclusive Contracts* (Social Science Research Network, Working Paper, 2004), *available at* http://ssrn.com/abstract=654187. More generally, platforms are natural businesses for two-part tariffs involving an access fee and a usage fee.

in demand on the first side because of the direct effect of the price elasticity of demand; then, demand on both sides decreases as a result of the indirect effects from the externalities. The change in revenue from a change in price for *A*s, therefore, depends on the price elasticity of demand for *A*s and the indirect network effects between the two sides.[35]

Of course, the platform would like to find the prices that maximize its profits by taking these same sorts of considerations into account.   Single-sided businesses determine profit-maximizing profits by selecting the output level at which marginal revenue equals marginal cost and then charge the corresponding price for this quantity from the demand curve.[36] For 2SPs, three results appear to be robust:

- The optimal prices depend in a complex way on the price elasticities of demand on both sides, the nature and intensity of the indirect network effects between each side, and the marginal costs that result from changing the output of each side.
- The profit-maximizing, non-predatory prices may be below the marginal cost of supply for that side or even negative.
- An increase in marginal cost on one side does not necessarily result in an increase in price on that side relative to price on the other.[37]

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[35] Costs necessarily go down. As is always the case with profit maximization, the price increase is profitable if revenues do not decline more than costs decline. This equilibrium is often described by the standard Lerner formula that states that the price-cost margin equals the inverse of the elasticity of demand.

[36] The standard Lerner formula addresses this equilibrium and provides that the price-cost margin equals the inverse of the elasticity of demand. *See* DENNIS W. CARLTON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 92 (Addison-Wesley 3d ed. 1999).

[37] Under the particular demand assumption employed by Jean-Charles Rochet and Jean Tirole, the ratio of the profit-maximizing prices the two sides are charged is independent of side-specific marginal costs. An increase in the marginal cost on one side will raise both prices, keeping

> More generally, the relationship between price and cost is complex, and the simple formulas used in single-sided markets do not apply.

For many platforms it is sensible to charge two different kinds of prices: an access charge for joining the platform and a usage charge for using the platform. Although these costs are interdependent, one can think of the access charge as affecting how many customers join the platform and the usage charge as affecting the volume of interactions between members of the platform. Most software platforms levy access charges on users—who have to license the software platform but then can use it as much as they want—and impose neither access nor usage charges on developers.[38] Videogame console vendors, however, charge a usage fee to game developers—a royalty based on the numbers of games that are sold. Users pay this usage fee indirectly when they purchase games for the console. Payment card systems also generally charge merchants a usage fee. Cardholders may pay an access fee (the annual card fee), but they pay either no usage fee or a negative one if they receive rewards.

The profit-maximizing reliance on access versus usage fees depends on many factors, including the difficulty of monitoring usage and the nature of the externality between the two sides. Cardholders care about card acceptance, for instance, while merchants care about usage. Therefore, it seems sensible not to charge merchants for access and not to charge consumers for usage. The empirical evidence suggests that prices that are at or below marginal cost are common for 2SPs.[39] Table 2 summarizes the evidence.

Table 2. Examples of 2SP Pricing Structures[40]

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their ratio unchanged. This is not a general result, but it does illustrate a possibility that does not exist in single-sided markets. Rochet & Tirole, *supra* note 2, at 997.

  [38] Evans et al., *supra* note 14, at 31.

  [39] Evans I, *supra* note 3, at 328.

  [40] Note: • and Ø indicate that the entity either pays or does not pay, respectively, for either access to or usage of the 2SP. Items in

Industry	Side	Access	Usage
Heterosexual Dating Clubs	Men	√	√
	Women	Ø	Ø
DoCoMo i-Mode	User	√	√
	Content-Provider	Ø	√
U.S. Real Estate Brokers	Seller	√	Ø
	Buyer	Ø	Ø
Magazines	Reader	√ (=MC)	Ø
	Advertiser	Ø	√
Shopping Malls	Shopper	–	Ø
	Store	√	Ø
PC Operating Systems	User	√	Ø
	Developer	√ (<MC)	Ø
Video Game Consoles	Player	√ (=MC)	Ø
	Game Developer	√ (<MC)	√
Payment Card Systems	Merchant	Ø	√
	Cardholder	√ (<MC)	Ø

B.   Design Decisions

2SPs are in the business of encouraging customers to join their platforms and stimulating them to interact with each other once they have joined. They design their platforms with this in mind. However, this model can lead to decisions that, in a narrow sense, harm one side.

A simple example is a shopping mall. Shoppers would prefer to get to stores in the least amount of time. Merchants, however, would like to maximize the amount of foot traffic outside their stores, and therefore, the number of

parentheses indicate where marginal cost or below-marginal cost pricing is prevalent for a particular side of a 2SP.

potential shoppers. Shopping malls are sometimes designed to encourage shoppers to pass by many stores, e.g., by situating the up and down escalators at different ends of the mall.

Advertising-supported media represent another obvious example. Viewers would like to gain access to the content—and perhaps even the advertisements of their choice—in the most convenient way. Some magazines are laid out to make it difficult to find even the table of contents or the continuation of an article without thumbing through many advertisements. Television watchers might benefit from having advertisements clustered at the beginning or the end of each program, but television providers (in the United States, at least) typically intersperse the advertisements and may also precede them with a cliffhanger to discourage viewers from taking a long break.

2SPs may also bundle features that directly benefit side *A* but harm side *B* (putting aside the indirect externalities from increasing the participation of side *A*). For example, all software platforms include features that do not benefit most users.[41] However, some developers value these features, and in particular, value knowing that any user of the software will have that feature and will therefore be able to run its applications. All payment card systems require merchants that take their cards for payment to honor all of their cards for payment, regardless of whom presents it or which entity issued it. Some merchants would benefit from being selective—taking cards only from people who lack cash, for example—but this would reduce cardholders' security that their cards will be taken at all stores that display the acceptance mark.[42]

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[41] E.g., the "Phone Dialer" and "HyperTerminal" programs that are embedded in the Microsoft Windows operating system.

[42] There are special cases where these requirements, e.g., linking acceptance of credit and debit cards, have led to tying claims. This paragraph is not meant to suggest that tying could not be used in an anticompetitive way by 2SPs, but rather to point out that there is an additional efficiency explanation for at least one aspect of this practice

C. Rules and Regulations

Given that platforms promote interactions between customers and seek to harness indirect network externalities, it should come as no surprise that 2SPs have an incentive to devise rules and regulations that promote these externalities and limit negative externalities between customers. The most sophisticated rules and regulations may be those that exchanges employ. All exchanges have rules against "front-running."[43] This practice occurs when a broker receives a large purchase order from a customer, first buys on his own account, then executes the customer order, which drives the price up slightly, and then sells on his own account and pockets the resulting profit. Banning this practice directly harms brokers, but it makes buyers more confident that they are getting the best price possible, and thereby boosts volume on the exchange.

Cooperative 2SPs have further need for rules and regulations because the behavior of their members can affect the value of the 2SP as a whole. Visa, for example, has rules that govern the appearance of cards issued by members to provide some uniformity for the common brand, as well as, to prevent members from using the brand inappropriately. The system also has rules that address disputed transactions. Acquirers have an incentive to favor their customers (merchants) in a dispute while issuers would favor their customers (cardholders). The system's rules attempt to find a balance between these competing interests in order to increase the attractiveness of the system as a whole.

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that does not arise in one-sided businesses. EVANS & SCHMALENSEE, *supra* note 21, at 291-94.

[43] *See, e.g.*, Press Release, United States Department of Justice, Former New York Stock Exchange Floor Clerk Pleads Guilty to "Front-running" Securities Fraud Scheme (Sept. 12, 2005), *available at* http://www.usdoj.gov/usao/nye/pr/2005sep12.htm.

IV. INDUSTRIAL ORGANIZATION OF MARKETS WITH 2SPS

Casual empiricism shows that industries with 2SPs are quite diverse.[44] We explain some of the basic determinants of this heterogeneity from a theoretical perspective and then document the common characteristics by surveying industries that appear to be dominated by 2SPs.

A. Determinants of Platform Size and Structure

Five fundamental factors determine the relative size of competing 2SPs. Table 3 summarizes the factors we discuss below and their effect on size, with a "+" indicating that there is a positive association between size and the factor.

Table 3. Determinants of Industry Structure

Cause	Effect on Size/Concentration
Indirect network effects	+
Scale economies	+
Congestion	-
Multihoming	-
Platform differentiation	-

1. Indirect Network Effects

Indirect network effects between the two sides promote larger and fewer competing 2SPs. Platforms with more customers in each group are more valuable to the other group. For example, more users make software platforms more valuable to developers, and more developers make software platforms more valuable to users. These positive feedback effects make platforms with more customers on both sides more valuable to these customers. To take another example, a payment card system whose cards are taken at more merchants is more valuable to card users—

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[44] Evans I, *supra* note 3, at 333; Rochet & Tirole, *supra* note 2, at 1005.

that is why we see card systems touting their acceptance (e.g., "MasterCard: No card is more accepted.") in consumer advertisements.

If there were no countervailing factors, we would expect that indirect network effects would lead 2SPs to compete *for* the market. First, movers would have an advantage, all else being equal. We would face the familiar story in which the firm that obtains a lead tends to widen that lead as a result of positive feedback effects, and therefore, wins the race for the market.[45] Other firms could compete with this advantage only if they offered consumers on either side something that offset the first mover's size advantage.

Indirect network effects may decline with the size of the platform. For example, the probability of finding a match increases at a diminishing rate with the number of individuals on either side (buyers or sellers, men or women).[46] At some point, positive externalities from more participants may turn into negative externalities in the form of congestion, as discussed below.

2. Economies and Diseconomies of Scale

For many 2SPs, significant fixed costs associated with providing the platform seem likely. This should lead to scale economies over some range of output. For example, card payment systems have to maintain networks for authorizing and settling transactions for cardholders and merchants (and for their proxies—issuers and acquirers—in the case of association-based payment systems such as MasterCard). The costs of developing, establishing, and maintaining these networks are somewhat independent of volume. To take another example, there is a fixed cost of developing a software platform, but a low marginal cost of providing that platform to developers and end users. In some cases, the

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[45] *See, e.g.*, David S. Evans & Richard Schmalensee, *A Guide to the Antitrust Economics of Networks*, 10 ANTITRUST MAG. 36 (1996); CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY 173-74 (1998).

[46] Evans I, *supra* note 3, at 325-81.

scale economies may operate mainly on one side. For example, there are scale economies in providing newspapers to readers (there is a high fixed cost of creating the newspaper and a relatively low marginal cost of reproducing and distributing it), but not in providing space to advertisers. Lastly, some physical platforms, such as trading floors and singles clubs, have scale economies, at least in the short run, up to their capacity levels.

Diseconomies may set in at some point for various reasons on one or both sides. For example, to persuade existing end users to replace (i.e., upgrade) their existing software platform, platform vendors have to add features and functionality. Many of these improvements may be designed to encourage application developers to write new or improved applications for the platform, which in turn benefit end users. However, as software platforms have gotten larger and more complex, it has become more expensive and time consuming to add features and functionality. For example, the most recent version of Apple OS took four months longer to develop than the previous version.[47] Similarly, Microsoft's "Longhorn" operating system has also been plagued with delays.[48]

3. Congestion and Search Optimization

Several design issues tend to limit the size of 2SPs. Physical platforms, such as trading floors, singles clubs, auction houses, and shopping malls, help customers search

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[47] For Apple OS release dates, see Steven Musil, *This Week in Tiger: Apple releases Mac OS X 10.4*, CNET NEWS, Apr. 29, 2005, *available at* http://news.com.com/This+week+in+Tiger/2100-1045_3-5689777.html;
Jason Snell, *Jaguar Unleashed: Mac OS X 10.2 Arrives*, MACWORLD, Sept. 1, 2002, at 25; Sarah A. Stokely, *Apple Sets Panther Release Date*, IDG DATA, Oct. 10, 2003, *available at* http://www.computerworld.com.au/index.php/id;1638961373;fp;512;fpid;83 917122.

[48] Ina Fried & Margaret Kane, *Microsoft revamps its plans for Longhorn*, CNET NEWS, Aug. 27, 2004, *available at* http://news.com.com/Microsoft+revamps+its+plans+for+Longhorn/2100-1016_3-5327150.html.

for and consummate mutually advantageous exchanges. At a given size, expanding the number of customers on the platform can result in congestion that increases search and transaction costs.[49] It may be possible to reduce congestion by increasing the size of the physical platform, but that in turn may increase search costs. Indeed, to optimize a customer's search for partners, 2SPs may find that it is best to limit the size of the platform and prescreen the customers on both sides to increase the probability of a match. One might argue that singles clubs do this explicitly (by deciding who can get into an "exclusive" club) or implicitly (compare the offerings of church-oriented singles groups and Club Med resorts).[50] We will return to this subject below in discussing platform differentiation. Congestion may also arise on one side alone. For example, increasing the volume of advertising in a newspaper may not only crowd out the content that attracts the readers, but also may result in a cacophony of messages that reduces the effectiveness of any particular advertisement.

4. Product Differentiation and Multihoming

Because 2SPs are subject to network effects and tend to have economies of scale, one might expect that industries based on 2SPs would tend towards natural monopoly or at least be highly concentrated. Product differentiation is an important countervailing force.

Platforms can differentiate themselves from each other by choosing particular levels of quality (what is known as "vertical differentiation").[51] Consumers choose a higher or

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[49] For a general discussion on matching, search, and congestion, see, e.g., ROBERT SHIMER & LONES SMITH, *Matching, Search, and Heterogeneity,* 1 ADVANCES IN MACROECONOMICS 1, 3-4, 11-14 (2001); Mark Rysman, *Competition Between Networks: A Study of the Market for Yellow Pages*, 71 REV. ECON. STUD. 483, 484-99 (2004).

[50] See Section IV.A.4 *infra* for a more detailed discussion of this subject.

[51] JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 96-97 (MIT Press 1988).

lower quality of platform depending on their income and relative demand for quality. There are, for example, upscale and downscale malls. Platforms can also differentiate themselves from each other by choosing particular features and prices that appeal to particular groups of customers (what is known as "horizontal differentiation"). Thus, there are numerous advertising-supported magazines that appeal to particular segments of readers and advertisers (e.g., *Cape Cod Bride* or *Fly Fisherman*).

Horizontal differentiation may cause customers to join and to use several platforms—a phenomenon that Rochet and Tirole have called "multihoming."[52] Customers find certain features of different competing platforms attractive, and therefore, rely on several sources. Payment cards are an example of multihoming on both sides. Most merchants accept credit and debit cards from several systems, including those that have relatively small shares of cardholders.[53] Many cardholders carry multiple credit cards, although they may tend to use a favorite card most often.[54] Advertising-supported media also have multihoming on both sides—advertisers and viewers rely on many differentiated platforms. Other 2SPs have multihoming only on one side. Most end users rely on a single software platform for their personal computers, while many developers write for several platforms.[55]

B. Empirical Evidence on 2SP Industry Structure

While there have been few rigorous empirical studies of 2SPs, it is possible to see some regularities in the industries where 2SPs predominate. Table 2 above and Table 4 reveal several of these features:

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[52] Rochet & Tirole, *supra* note 2, at 3.

[53] EVANS & SCHMALENSEE, *supra* note 21, at 148.

[54] *See* Mark Rysman, *An Empirical Analysis of Payment Card Usage* (Boston University, Working Paper, 2004).

[55] Evans et al., *supra* note 14, at 18.

- Except for some exchanges, it is relatively uncommon for industries based on 2SPs to be monopolies or near-monopolies. Some industries based on 2SPs have several large differentiated platforms, while others have many small platforms that are differentiated by location, as well as, along other dimensions.
- Multihoming on at least one side is common, which indicates that horizontal product differentiation tends to be the norm.
- Asymmetric pricing is relatively common. Many 2SPs appear to obtain the preponderance of their operating profits (revenues minus direct costs) from one side. A nontrivial number of 2SPs appear to charge prices that are below marginal cost or below zero.

Table 4. Presence of Multihoming and Largest Competitor Share of Selected 2SPs[56]

Multi-Sided Platform	Sides	Presence of Multihoming	Largest Competitor Share in the United States

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[56] Adapted from Evans I, *supra* note 3, at 325-81. Sources: UNITED STATES CENSUS BUREAU, 2002 ECONOMIC CENSUS, *available at* http://www.census.gov/econ/census02/guide/INDSUMM.HTM> (industry share data); Newspaper Association of America, *Top 20 U.S. Daily Newspapers by Circulation*, http://www.naa.org/info/facts01/18_top20circ/index.html; Stephen Labaton, *U.S. Backs Off Rules for Big Media*, N.Y. TIMES, Jan. 28, 2005, at C1; AL GILLEN & DAN KUSNETZKY, WORLDWIDE CLIENT AND SERVER OPERATING ENVIRONMENTS 2004-2008 FORECAST, IDC Market Analysis No. 32,452 (2004); SCHELLEY OLHAVA, WORLDWIDE VIDEOGAME HARDWARE AND SOFTWARE 2004-2008 FORECAST AND ANALYSIS, IDC Market Analysis No. 31,260 (2004).; NIELSEN MEDIA RESEARCH, THE NIELSEN REPORT NO. 828 (2005); NIELSEN MEDIA RESEARCH, THE NIELSEN REPORT NO. 833 (2005).

Residential Property Brokerage	Buyer Seller	*Uncommon*: Multihoming may be unnecessary, since a multiple listing service allows the listed property to be seen by all member agencies' customers and agents.	Fifty largest firms have a 23% share. (2002)
Securities Brokerage	Buyer Seller	*Common*: The average securities brokerage client has accounts at three firms. Note that clients can be either buyers or sellers or both.	Four largest firms accounted for 37% of in securities brokerage and 16% in financial portfolio management (2002).
Newspapers and Magazines	Reader Advertiser	*Common*: In 1996, the average number of magazine issues read per person per month was 12.3. *Also common for advertisers*: for example, AT&T Wireless advertised in the New York Times, The Wall Street Journal, and Chicago Tribune, among many other newspapers, on Aug. 26, 2003.	Wall Street Journal had a 28% share of the five largest newspapers. (2001)

Network Television	Viewer Advertiser	*Common*: For example, viewers in Boston, Chicago, Los Angeles, and Houston, among other major metropolitan areas, have access to at least four main network television channels: ABC, CBS, FOX, and NBC. *Also common for advertisers*: for example, Sprint places television advertisements on ABC, CBS, FOX, and NBC.	U.S. law forbids broadcasters from owning TV stations reaching more than 35% of the nation's television audience.
Operating System	End User Application Developer	*Uncommon for users*: Individuals typically use only one operating system. *Common for developers*: As noted earlier, the number of developers that develop for various operating systems indicates that developers engage in significant multihoming.	Microsoft has a 96% share of revenue of client operating systems. (2004)
Video Game Console	Game Player Game Developer	*Varies for players*: The average household (that owns at least one console) owns 1.4 consoles. *Common for developers*: For example, in 2003, Electronic Arts, a game developer, developed for the Nintendo, Microsoft, and Sony platforms.	Sony PS1 and PS2 had a 63% share in North America. (2003)

Payment Card	Cardholder Merchant	*Common*: Most American Express cardholders also carry at least one Visa or MasterCard. In addition, American Express cardholders can use Visa and MasterCard at almost all places that take American Express.	The Visa system had an 45% share of all credit, charge, and debit purchase volume. (2004)

V. THE ANALYSIS OF MARKET POWER

It is useful to start with market power to clarify ideas. Economists generally care about determining whether an entity (a firm or a collection of firms) has market power for three reasons, which vary in importance across antitrust matters. First, entities that have or could obtain significant market power can, by definition, raise prices above the competitive level, restrict output, and reduce consumer and social welfare. Second, and related the first reason, entities that have significant market power generally have the ability to engage in business practices that could foreclose competition. Third, entities that obtain significant market power as a result of a business practice may be able to recoup costs that they incur from investing in anticompetitive activities, such as predatory pricing and vertical foreclosure.[57] Business practices engaged in by entities that either lack market power or are unlikely to acquire it are often presumed benign (except of course for naked price fixing and related cartel practices).

The economics of 2SPs provides several insights into analysis of market power. It is of course an empirical question whether two-sidedness matters for a particular antitrust issue involving a particular two-sided platform business.

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[57] In contrast, economists and courts consider naked price fixing and related cartels as anticompetitive business practices, regardless of the amount of market power the entity holds.

The link between the customers on the two sides limits the extent to which a price increase on either side is profitable. Therefore, it necessarily limits market power, all else equal. Consider two sides *A* and *B*. An increase in the price for side *A* reduces the number of customers on side *A*, and therefore, reduces the value that customers on side *B* receive from the platform. The decrease in number of side *A* customers reduces the price that side *B* will pay and the number of customers on side *B*, which reduces the demand on side *B*. These positive feedback effects may take some time to work themselves out, but it is clear that the ordinary price elasticity on side *A* understates true price sensitivity.

Competition on both sides limits profits. Suppose that in a market without multihoming, there is limited competition on side *A* because customers cannot easily switch between vendors on that side, but there is intense competition on side *B* because customers can and do switch between vendors based on price and quality. Then, if competitors on side *B* cannot differentiate their products and otherwise compete on an equal footing, the ability to raise prices on side *A* will not lead to an increase in profits. Any additional profits on side *A* will be wiped away by competition on side *B*. This point is especially relevant for assessing incentives and recoupment. It is also worth noting that the possibility of multihoming on side *B* will permit positive profits as it reduces the intensity of competition.

For 2SPs, price equal to marginal cost (or average variable cost) on a particular side is not a relevant economic benchmark for evaluating either market power or claims of predatory pricing. As we saw above, the price on each side is a complex function of the elasticities of demand on both sides, indirect network effects, and marginal costs on both sides. Thus, it is incorrect to conclude, as a matter of economics, that deviations between price and marginal cost on one side indicate that 2SPs are pricing to exploit market power and drive out competition.[58]

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[58] For the 2SP as a whole, a formula similar to the standard Lerner index emerges in the Rochet-Tirole model. This is not a general result,

VI. MARKET DEFINITION

Using market definition facilitates understanding of the constraints on business behavior and assessment of the contours of competition that are relevant for evaluating a practice.[59] In some cases, the fact that a business could be considered a 2SP may be irrelevant, either because the indirect network effects, though present, are small or because nothing in the analysis of the practices really hinges on the interlinked demand. In other cases, the fact that a business is a 2SP will prove important both for identifying the real dimensions of competition and focusing on sources of constraints.

As a general matter, antitrust market definition has been criticized.[60] Although constraints on market power tend to be a matter of degree, in practice, common approaches to market definition label a product as either *in* the market (and therefore a constraint) or *outside* the market (and therefore not a constraint). The role of products within this artificially defined market is often then assessed based on shares of revenue received by products within the market, despite the fact that these products are imperfect substitutes for each other, and that other lesser, imperfect substitutes have been excluded altogether. Neither of these mechanical approaches to market definition has any basis in economics.

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and thus, it suggests that the overall price-cost margin is somewhat less relevant for evaluating overall market power than in single-sided businesses.

[59] MASSIMO MOTTA, COMPETITION POLICY: THEORY AND PRACTICE 40-41, 115-17 (Cambridge Univ. Press 2004).

[60] For example, Michael Katz, former Deputy Assistant at the Department of Justice, said, "Formal market definition has taken on a life of its own and this formalism attempts to impose sharp boundaries even where they do not exist. Particularly in differentiated products markets, mechanical market definition risks weakening the analysis rather than strengthening it and there are risks of misleading conclusions." *See EC Making Increasing Use of Merger Simulation Techniques in Antitrust Probes; Market Definition Taking Back Seat – Analysis*, MERGERMARKET.COM, Jan. 31, 2005 (website is password-protected, so article on file with the author).

Nevertheless, understanding constraints on business behavior and determining the contours of competition that are relevant for evaluating a practice are important steps in analyzing any antitrust matter. One can achieve this understanding through a looser form of market definition; one that is less insistent on defining sharp boundaries and that considers the degree of constraints than is often used in practice. In fact, industries with 2SPs are sufficiently complex that mechanical market definition exercises are particularly likely to obscure market realities.

Figure 1 below shows potential sources of competition constraints for a two-sided platform denoted by *A*. It faces competition of some degree from other differentiated 2SPs that serve the same customer groups (e.g., the newspapers in a city). It also faces competition from single-sided businesses that provide competitive services to one side only (e.g., billboards). Moreover, the 2SP faces competition from other 2SPs that provide products that compete mainly with one side but not the other (e.g., advertising-supported television). Of course, the existence of these constraints does not mean that they are important, only that they must be considered.

Figure 1. Types of Differentiated Platform Competition

[INSERT FIGURE]

Magill,[61] the leading European Community case involving the compulsory licensing of intellectual property, provides an interesting example of differentiated 2SPs. The defendants were television stations (RTE, BBC, and ITV) whose broadcasts were received in Ireland. RTE and ITV were advertiser-supported media[62]; BBC was a government-supported station with no advertising.

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[61] Joined Cases C-241/91 P and C-242/91 P (*Magill* cases), RTE and ITP v. Comm'n of the Eur. Cmtys. 1995 E.C.R. I-743.

[62] RTE also received by revenue from assessments charged to owners of television sets.

RTV, ITV, and the BBC operated another 2SP. They also produced television guides that contained their own weekly listings.[63] These guides charged a modest fee to readers like most magazines and earned significant revenues from advertisers. The stations benefited from subscribers both because they increased advertising revenue for the guides, and they increased the audiences for their stations.

Magill TV Guide (Magill) published a weekly advertising-supported guide that contained the listings of the three stations. The stations complained that this violated their copyrights, and Magill, with the Commission on its side, complained that this was anticompetitive. The European courts mandated that the stations provide a compulsory license to their copyrighted listings.[64]

The European Commission and the courts premised their decision on the existence of a market for weekly television guides *for readers* that contained listings of all three stations.[65] Analyzing market definition and power in such a case seems quite complicated, given the two-sided nature of the television guide business and its link with the two-sided television broadcast business. Furthermore, it is not possible to analyze the competitive constraints on weekly television guides—the essence of the market definition and power examination—without considering the sale of advertising directly through the guides and indirectly (in the case of RTV and ITV) through the television stations. Nor for that matter is it possible to understand the motivation of the television stations in refusing to license their listings to others without considering the two-sided nature of their businesses.

Taking two-sided features into account is important for the sorts of mechanical market definition exercises that have become popular in merger analysis. To illustrate this, we show how the existence of two separate customer groups

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[63] Each also provided their daily listings to newspapers—other 2SPs—that combined the listings.

[64] *Magill, supra* note 61, at ¶ 134.

[65] *Id.* ¶ 89-91.

affects critical loss analysis in the simple case where there are competing differentiated 2SPs.[66]   The same considerations apply to the SSNIP (small but significant non-transitory increase in price) analysis that is memorialized in the merger guidelines used by the United States and European authorities.[67]

Consider the standard single-sided critical loss approach to market definition. Given a small increase in price, the "critical loss" is the amount of output reduction that the hypothetical monopolist needs for its reduced profits from lost sales to exceed its revenues from higher prices on retained sales. The "actual loss" is the output reduction that would actually result from the small increase in price. Under this approach, if the actual loss is greater than the critical loss, then the products sold by the hypothetical monopolist are a relevant market.

One can undertake the same analysis in two-sided industries, but there are some important differences. The critical loss calculation must recognize that there are additional losses in two-sided industries. An increase in price on side A has the usual effect in reducing demand of side A. Moreover, the smaller side A is less attractive to side B, which causes a reduction in demand on side B. In turn, the smaller side B is now less attractive to side A, which leads to a reduction in demand on side A. And so on.

This process results in two effects that increase the losses caused by a price increase. First, there is a multiplier effect—the overall reduction in demand on side A is greater than in single-sided industries because the platform is less attractive to side A consumers because side B is smaller. Second, in addition to losses on side A, there are now losses on side B, which are also subject to a multiplier effect.

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[66] As noted above, horizontal or vertical differentiation would to be necessary for competing 2SPs to be even viable.

[67] DOJ & FTC, U.S. HORIZONTAL MERGER GUIDELINES, *available at* http://www.usdoj.gov/atr/public/guidelines/horiz_book/hmg1.html;   EU HORIZONTAL   MERGER   GUIDELINES,   *available   at* http://europa.eu.int/scadplus/leg/en/lvb/l26107.htm.

VII. CONCLUSION

The indirect network effects among customer groups served by a single business are strong in many important industries. Businesses in these industries operate 2SPs. The economics of 2SPs provide insights into how these businesses and industries behave, which are relevant for competition analysis, including market definition, coordinated practices, and unilateral practices. The economic literature provides robust results—that is, results that are not dependent on only fragile assumptions—that can assist in this analysis. These results include the consequences of interlinked demand between customer sides for prices; prices do not, contrary to the standard model, have a tight relationship with cost.

As with almost any application of economics to policy, several cautions are prudent. First, many of the theoretical results in the literature to date are, like those in other areas of industrial organization, based on quite abstract models of how industries operate and on special assumptions regarding demand and cost. Second, presently there has been little rigorous empirical research on 2SPs or competition among them. Third, the existing theoretical and current empirical work suggest that 2SP businesses are highly dependent on the specific institutions and technologies within an industry. Accordingly, one must be careful not to generalize inappropriately.