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Economics Of Vertical Restraints For Multi-Sided Platforms

By David S. Evans

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This paper presents an overview of what economists can say about vertical constraints by multi-sided platforms at this stage in the development of our knowledge about the economics of these businesses. It describes the general procompetitive and anticompetitive uses of vertical restraints by multi-sided platforms. It then focuses on the role of critical mass for multi-sided platforms and how vertical restraints might be used on the one hand, anti-competitively to prevent rivals from achieving critical mass and long-term growth and, on the other hand, pro-competitively, to ensure the platform and its customers that the platform will remain viable.

I. INTRODUCTION

Some firms enter into agreements with their customers that limit their ability to buy from rivals of the firms. These agreements are called “vertical restraints.” They include exclusive-dealing contracts, tying and bundling, conditional rebates, and meeting competition clauses. There is an extensive literature on how these restraints could increase economic efficiency, on the one hand, and how they could harm competition and consumers, on the other hand². Vertical restraints are also the subject of a considerable body of decisions by courts and competition authorities.³

This paper is about the use of vertical restraints by a particular kind of business known as a multi-sided platform.⁴ Multi-sided platforms create value by serving as intermediaries between two or more types of customers where one type of customer can realize value by interacting with another type of customer. The demand by one type of customer depends on the participation on the platform of one or more of the other types of customers.⁵

There are three main reasons for a focused analysis of vertical restraints by multi-sided platforms. First, certain features of these platforms raise special issues for the analysis of the procompetitive and anticompetitive uses of vertical restraints. Second, these platforms include an economically significant group of businesses including shopping malls, payments systems, software platforms, exchanges, dating venues, various types of media including radio, television, newspapers, and online businesses including search engines, social networks, and e-commerce. Third, multi-sided platforms are frequently under investigation for their use of vertical restraints; several important decisions have found that multi-sided platforms engaged in the anticompetitive use of vertical restraints.⁶

The literature on multi-sided platforms is relatively new.⁷ It is related to an older literature on network industries that recognized the importance of direct and indirect network externalities in firm and competitive dynamics. The multi-sided platform literature has developed behavioral models for firms with interdependent demand that build on the earlier work on network effects. It has also shown that indirect network effects are important for many industries such as shopping malls and exchanges that were not considered by the network effects literature.

Some of the issues discussed in this paper were presaged in the network industry literature, particularly the possible role of exclusive dealing in foreclosing entrants, but the multi-sided platform literature provides a richer and more nuanced treatment of these topics.⁸

This paper presents an overview of what economists can say about vertical constraints by multi-sided platforms at this stage in the development of our knowledge about these businesses.⁹ Section I describes several key features of multi-sided platforms that are helpful for analyzing the use of vertical constraints by these platforms. Section II explains how vertical restraints can help platforms achieve efficiencies that improve consumer welfare. Section III reviews possible anticompetitive vertical restraints in light of the traditional economics literature on vertical restraints and the more recent literature on the use of vertical restraints by multi-sided platforms. Section IV focuses on the key anticompetitive concern arising from the new literature on multi-sided platforms and the older literature on network effects: the use of vertical restraints such as exclusive dealing to prevent rival platforms, particularly entrants, from achieving the critical mass necessary for being viable platforms. Section V concludes with recommendations for how competition analysis should deal with vertical restraints given our current state of knowledge.

II. INTERDEPENDENT DEMAND AND EXTERNALITIES

Each type of customer for a multi-sided platform is referred to as a “side” of the platform. Multi-sided platforms facilitate interactions between members of each side. They do this by providing mechanisms that facilitate search, matching, and exchange. For example, financial exchange platforms provide mechanisms for helping traders search for trading opportunities, matching potential trading partners, and consummating transactions. Those interactions result in the creation of value. In some cases, such as dating venues, the platform simply gets the parties together and they decide whether there is a mutually advantageous exchange. In other cases, such as advertising-supported media, the platform subsidizes one side by providing valuable services to make members of that side available to the other side.

A. Externalities And Their Management

Multi-sided platforms typically have positive indirect network externalities that lead to positive feedback effects between the sides. Each member on one side can expect to realize more value if there are more members on the other side. That is because they have a higher likelihood of finding a trading partner and with more trading partners the expected value of the trade is higher as well. There is also a positive indirect externality in use between two trading partners. Each benefits if the other agrees to trade.¹⁰ These positive indirect externalities result in the linkage of demand schedules for the various sides. The demand by one side depends on the participation of the other sides and vice versa. The demand schedules for the sides of multi-sided platforms are therefore interdependent. Multi-sided platforms also have positive direct network effects at least to a degree. Having more members on the same side attracts more members on the other side.

While positive indirect network externalities are the main reason multi-sided platforms create value these platforms often also have to deal with direct and indirect negative externalities. Negative direct externalities can arise from congestion (too many people at the mall), com-

petition (at some point competition with other members outweighs the value of their attracting members to the other side), or bad behavior (nightclub brawls). Negative indirect externalities can arise because members on one side impose costs on members of the other side by behaving badly (hate speech on social networks), undersupplying or distorting information (selling practices on commerce sites), creating congestion (too many traders overloads electronic trading platforms), or otherwise reducing the value of the platform to the detriment of its members.

Multi-sided platforms create value for their participants, and profit for themselves, by managing these externalities. They can increase indirect network externalities, of course, by securing more members on each side of the platform. But, in addition, for a given number of members they can increase the value of the platform by increasing the amount of positive externalities among members and decreasing the amount of negative externalities. Multi-sided platforms have a number of instruments available for maximizing the value of the platform in addition to price. These include design choices, product offerings and the design and enforcement of rules and standards. Some of these instruments involve vertical restraints as discussed below.

As a result of positive indirect network externalities the entrepreneurs who start multi-sided platforms have to solve significant coordination problems to create an economically viable platform and one that can rely on positive feedback effects for growth. The platform must have enough members of each side on board to create a situation in which a member realizes enough value to participate in the platform and the platform can charge enough to operate profitably. Solving this conundrum is one of the key challenges these entrepreneurs face.

B. Critical Mass and Growth

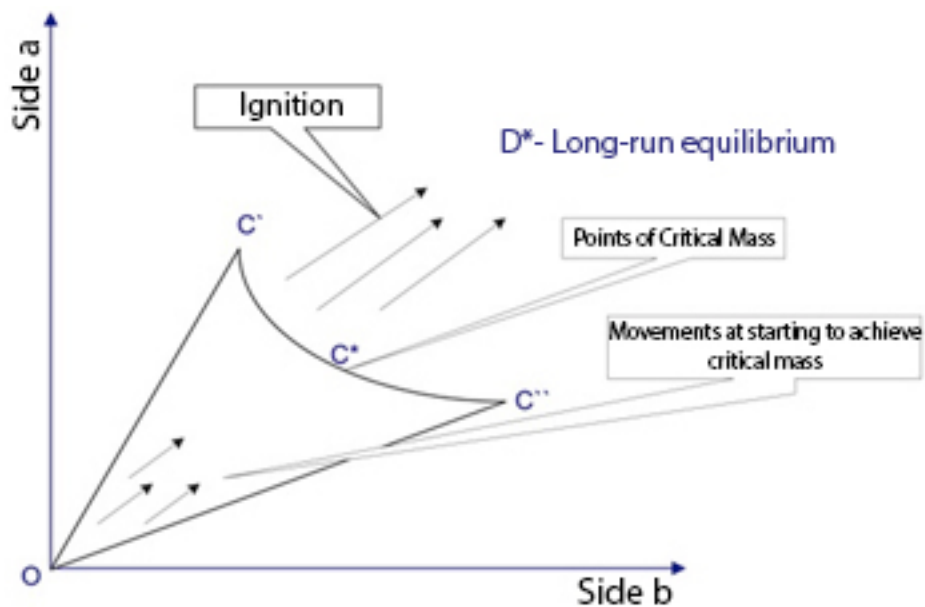
Multi-sided platforms face a dynamic growth problem.¹¹ To be viable platforms need to achieve “critical mass” which involves a sufficient number of members of both sides to create enough value to attract more members of each side. Once a platform achieves critical mass indirect network externalities enable it to grow by attracting more members. That is, once a platform reaches critical mass, it “ignites” in the sense that it is propelled forward by its own momentum from positive-feedback effects. If a platform has not achieved critical mass then members who have joined it tend to stop participating because it does not provide enough value and new members do not join because they do not realize enough value either. In this case the platform “implodes” through a process in which positive feedback effects work in reverse: as members of one side stop participating, the value to members of the other side falls and some of them stop participating, which leads to more members of the first side to stop participating.

As a practical matter, platforms achieve critical mass through getting customers who like to try new things (“early-adopters”), customers with especially high values for participating in the platform, and customers who expect that the platform will obtain critical mass and are therefore willing to make the investment to join. If they can keep the interest of these initial customers, and get them to through increasing growth they can reach critical mass and ignite. If they cannot then they implode.¹² In some cases, platforms can start with critical mass by securing enough customer relationships before they launch.¹³ In other cases they can move sequentially by attracting customers on one side (using content to attract viewers) and then when

they have enough of those customers making them available to customers on the other side (advertisers).

Figure 1 shows the basic concept of critical mass and ignition for a two-sided platform with sides A and B and for a common case in practice. There is minimal numbers of customers, shown on C'-C", that, if achieved, provides a "thick enough market" or a sufficiently "liquid" market to permit sustainable growth. Once a platform achieves critical mass, by being at a point on C'-C", for example, it can grow to its profit-maximizing potential of D*; if it does not achieve critical mass on the segment C'-C" it contracts and ultimately fails. The optimal growth path to critical mass and to long-run equilibrium is well away from the horizontal and vertical axes in most plausible cases.¹⁴ Relatively balanced growth is necessary. This is reflected in Figure 1 in that the equilibrium growth path to critical mass must occur within the triangle 0-C'-C". Having too many of one side and too few of another side will cause implosion.

Figure 1: Catalytic Ignition and Critical Mass



New multi-sided platforms must engage in a variety of tactics to move from an initial situation of having no consumers to a point of critical mass from which the business can grow through positive feedback effects. In doing so they often must shape the expectations of potential members. To incur the costs of joining and participating in the platform members of each side must expect that there will be enough members of other sides to make it worth their while.

Achieving critical mass is a difficult business problem that multi-sided businesses face that single-sided ones do not. The vast number of successful multi-sided businesses, however, demonstrates that ignition is a solvable problem. Moreover, the fact that many multi-sided industries support several viable platforms, and have experienced entry, demonstrates that the success of a first mover at ignition does not prevent followers from achieving critical mass either.¹⁵ In some industries, the critical mass needed is relatively low as a proportion of total industry output.

C. Multi-Homing

The competitive dynamics of multi-sided platforms depend in theory and in practice on the number of platforms that a customer on each side uses, on differences between the sides in the number of platforms used, and on the ability of a customer on one side to dictate the choice of platform for the other side. A customer “single homes” if she uses only one platform in a particular industry and “multihomes” if she uses several.¹⁶

Armstrong analyzed the role of “multi-homing” in platform competition. Suppose platforms in some market create value by having agents of Type A and Type B as members. If Type A agents only join one platform, then Type B agents can only gain access to Type A agents by joining that same platform. When there is single-homing on one side and multi-homing on the other side in his model, Armstrong shows that platforms have incentives to compete aggressively for the single-homing customer who will therefore pay low prices. With these customers on board the platform will then earn its profits from the customers who multi-home on the other side. Armstrong referred to the single-homing side as a “competitive bottleneck” in this situation.

Sometimes multi-homing customers on one side can dictate the choice of platform to agents on the other side of the market. For example, most consumers use multiple payment methods and even use multiple payment cards and most merchants accept all of these payment alternatives. In practice, one can argue that the consumer dictates which payment system is used. The consumer generally presents one particular payment method at checkout out of the choices the merchant has made available. For the purposes of that transaction the consumer single-homes and, by the same logic as above, the platform has an incentive to compete aggressively for the consumer to use their payment method.¹⁷

It is not clear how robust the “competitive bottleneck” argument is, however. In software platforms, for instance, the price structure is the opposite of what the competitive bottlenecks theory would predict. Most personal computer users rely on a single software platform, while most developers write for multiple platforms.¹⁸ Yet personal computer software providers generally make their platforms available for free, or at low cost to applications developers and earn profits from the single-homing user side.

Nevertheless, platforms face a challenge in securing critical mass when customers single home. To reach critical mass entrants have to rely on attracting customers that have not yet committed to a platform or on persuading customers of other platforms to switch. Entry may, therefore, be challenging in mature platform industries where most consumers have committed to a platform and in situations in which there are significant platform switching costs.

D. Product Differentiation

Multi-sided platforms can engage in horizontal and vertical product differentiation. For one-sided firms, horizontal and vertical differentiation locates the firm near a pool of potential customers and helps determine pricing. For multi-sided platforms, by determining the customers on one side, horizontal and vertical differentiation affects demand on the other side. Because of these interdependencies, a platform must make differentiation decisions jointly for all of the

sides it serves. Moreover, the selection of customers on one side is one possible way to differentiate the platform horizontally or vertically.

A shopping mall developer, for example, must decide on a number of different product attributes such as location, size, parking, and quality of construction. But it also needs to decide what kind of stores and customers it wants to attract. Those are obviously interdependent. It could be an upscale mall and only rent space to merchants with an upscale clientele. If it succeeds in attracting enough such merchants it will tend to attract an upscale clientele. In order to do this, of course, it is likely to make other decisions—such as locating close to wealthy towns and using better finishes—that help attract wealthy customers and merchants they tend to patronize.¹⁹ Product differentiation, as this example suggests, is a tactic that firms can use to create value by making it easier for agents to find counterparties for value-increasing exchange. The upscale mall, for example, makes it easier for shoppers to find stores that serve their tastes and easier for stores to find customers. Platforms can also create value for agents on one side by limiting how much competition they face for a match.²⁰

Product differentiation is a key reason why many industries with multi-sided platforms have multiple competitors even though indirect network effects and sometimes economies of scale would seem to propel them to monopolies.²¹ Job placement provides an interesting example. The online portion of this industry consists of job boards that help match job searchers with employers through online postings and search. In the US there are two large job boards that cover many different job categories. But then there are hundreds of other job boards that specialize in different job segments such as professionals (LinkedIn.com) and media jobs (mediabistro.com). By specializing, these job boards presumably increase matching efficiency. Beyond the job boards there are recruiting services that work for employers or employees. The result is a highly fragmented industry of two-sided platforms.

III. VERTICAL RESTRAINTS AND PLATFORM VALUE

Platforms create value by making the exchange of pecuniary and non-pecuniary value more efficient. They do that typically by reducing the transactions costs for the members of the various sides of the platforms. The creation and distribution of that value are intertwined.²² The platform owner can distribute the value created between the two sides, and thereby determine the consumer surplus each receives and to itself as profit. The distribution of value between the sides determines the extent to which the platform attracts participants on those sides. Platform owners may subsidize some sides—in the sense of providing marginal value at below marginal costs—to secure their participation.

The value created by the platform, and the overall consumer surplus distributed to the members of the multiple sides, depends in part on the platform's success in increasing positive externalities and reducing negative externalities. Moreover, the platform can create consumer surplus on a sustainable basis only if it reaches critical mass.

Vertical restraints can assist in this sustainable value creation.²³ To explain how we consider a two-sided platform consisting of sides A and B. The same considerations apply to platforms with more than two sides.

A. Procompetitive Explanations For Vertical Restraints By Multi-Sided Platforms

There are three broad categories of procompetitive explanations for vertical restraints that apply to multi-sided platforms.²⁴ First, vertical restraints help platforms achieve a natural monopoly that provides the largest benefits to consumers overall. Second, vertical restraints help platforms deal with expectation and coordination problems that result in welfare gains for platform users. Third, vertical restraints on one side of the platform benefit the other side of the platform and increase consumer welfare overall.

PRODUCT DIFFERENTIATION IS A KEY REASON WHY MANY INDUSTRIES WITH MULTI-SIDED PLATFORMS HAVE MULTIPLE COMPETITORS EVEN THOUGH INDIRECT NETWORK EFFECTS AND SOMETIMES ECONOMIES OF SCALE WOULD SEEM TO PROPEL THEM TO MONOPOLIES.

1. Natural Platform Monopolies

As a result of indirect network effects, customers on side A realize greater value when there are more customers on side B and customers on side B realize greater value when there are more customers on side A. There are some circumstances in which these positive feedback effects could imply that it would be socially optimal to have a single platform. That is, the industry served by the platform is a natural monopoly.²⁵ That could occur if there are no diseconomies of scale on the cost side, no congestion effects on the demand side, and homogeneous consumers on both sides so that there is not optimal to have differentiated platforms. The monopoly platform could maximize the value for consumers if the benefits of positive feedback effects outweigh higher prices resulting from the exercise of market power.²⁶ Vertical restraints that provide incentives for customers to consolidate demand on a single platform could therefore increase consumer welfare in this situation.²⁷

This same argument applies even if there is not a natural monopoly. Vertical restraints could be used to help consolidate demand in a few possibly differentiated platforms. The general point is that with positive indirect effects there are gains at least up to a point in having customers on board the same platform.

2. Demand Coordination, Expectations, and Vertical Restraints

There are other possible procompetitive benefits of vertical restraints that do not hinge on the argument that consolidating demand increases consumer welfare. Vertical restraints can ensure the platform will have enough participation by members of side A to exceed critical mass and to grow through positive feedback effects. This provides value to the platform participants on all sides. They obtain some assurance that their investments in joining and participating in the platform will provide a return. The vertical restraints reduce the risk that the platform will implode. By increasing participation rates vertical restraints also increase the expected value of the gain from trade on the platform. They, in effect, assure a greater supply of liquidity—potential partners with whom to enter into a value-increasing exchange—to platform participants. These assurances help the platform solve its fundamental coordination problem. The platform can only secure participation of members if they expect that members of the opposing side will participate as well.

We can see the procompetitive value of the vertical restraints providing this value by considering the but-for world in which the platform cannot avail itself of these restraints. New platforms might not be able to reach critical mass without securing commitments that customers on one side will only be able to interact with customers on the other side through their platform. Moreover platforms that have exceeded critical mass might invest less in the platform, and possibly not be willing to operate the platform, if they face a risk that a reduction in participation on one side could, through reverse positive feedback effects, result in a downward spiral for the platform. Platform participants would ultimately lose in these situations because the platform would either not be available at all to them or it would be a smaller platform offering less value.

3. Vertical Restraints and Indirect Externalities

Vertical restraints on side A can also result in benefits to side B. Although these restraints may decrease the welfare of side A participants in the first instance they could increase the welfare of side B participants and ultimately also increase the welfare of side A participants as a result of positive feedback effects. The platform may be able to increase value by ensuring participants on side B that when they interact with participants on side B that side B participants will provide particular products and services of specified quality, will make the terms of trade transparent, will not act opportunistically, and will not engage of other forms of behavior that could harm members of side B. Some of the restrictions on participants on side B could entail vertical restraints (tying for example) or could be interpreted as possible vertical restraints (no surcharge rules for example).

B. Analysis Of Typical Vertical Restraints

We now consider specific vertical restraints and their possible procompetitive benefits in light of these three considerations.

1. Exclusive Dealing

Exclusive dealing contracts limit the ability of customers to purchase from other firms. The usual procompetitive justifications for these contracts apply to multi-sided platforms.

These contracts increase the certainty of demand. That then reduces the risk for the firm and increases its ability to engage in resource planning that will benefit all customers. For example, a shopping mall developer would incur risk if the anchor store, which occupies a large space in the mall, could have a nearby stand-alone store or an anchor store at a competing nearby mall.

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Exclusive dealing contacts might enable the firm to make sunk-cost investments that benefit the customer without facing the risk that the customer will opportunistically refuse to bear the costs of these investments after they have been made. For example, a financial exchange platform might invest in creating a trading platform for a new class of securities. It may

want large traders to commit exclusively to the platform before incurring those costs to avoid ex-post opportunistic haggling.

These contracts also prevent free riding whereby customers receive services from the firm but then purchase from another firm at a lower price made possible because that other firm does not provide those services. For example, an ecommerce platform could provide services to connect a buyer and seller for a mutually advantageous transaction but the parties might try to consummate the trade off of the platform and thereby avoid the transaction fees.

The existence of indirect positive externalities between sides provides additional ways in which exclusive dealing contracts could increase the efficiency of multi-sided platforms. As noted earlier a platform can increase the value it provides to its customers on one side by enabling them to interact with more customers on the other side. In theory, competition among platforms could result in the consolidation of demand on the most efficient platform. In practice there could be a coordination problem. Customers would benefit if more of them moved to a common platform. But they do not consolidate their demands perhaps because of switching costs or asymmetric information. A platform—particularly the more efficient one—could help solve this coordination problem by entering into a contract that requires different groups of customers to consolidate their demands.

These exclusive dealing contracts could be particularly helpful in increasing efficiency when customers on side engage in single homing. Customers on the other side incur pecuniary and non-pecuniary costs accesses these single homing customers across several platforms and may not realize the benefits of having a thick enough market on any one platform. By consolidating these customers through exclusive deals the platform could generate additional value that could benefit itself as well as the customers on all sides.

Exclusive dealing contracts with customers on one side (A) also provide potentially valuable guarantees to customers on the other sides (B for example). The side B customers know that they will be able to access side A customers if they use side B. Such guarantees would be more valuable the more side B customers have to incur sunk costs in joining the platform.

Finally, exclusive dealing contracts could also help ensure the platform as well as its customers on both sides that the platform will achieve critical mass and be in a position to grow. This increased certainty for the platform also makes its entrepreneur and investors more willing to invest in the platform. For example, video game console companies may enter into exclusive deals with developers to help ensure that they will have both a supply of games and game users who cannot get the game elsewhere.²⁸

2. Bundled Rebates, Meeting Competition, and other Price Restraints

Competitive concerns over bundled rebates arise when they provide incentives for customers to consolidate their purchases with a single provider. For multi-sided platforms these rebates have the same possible procompetitive effects as exclusive dealing. Instead of requiring a customer to consolidate its demand by contract, bundled rebates give the customer a strong financial incentive to do so.

The literature has offered other justifications for bundled rebates based on analyses of single-sided firms. These justifications include avoiding double marginalization, reducing transactions cost, and various price discrimination-based explanations. These justifications may also apply to multi-sided firms. However, the analysis of whether they increase consumer welfare would need to account for the impact of these pricing mechanisms on the demand by the other sides and positive feedback effects.²⁹

Meeting competition clauses are likely to have procompetitive justifications for multi-sided platforms beyond those that have been offered for single-sided firms. Multi-sided platforms use complex pricing mechanisms to solve problems resulting from interdependent demand. Particular groups of customers create more value for the platform because of their value to other participants. Prices and other terms of services are therefore based not just on cost but also on the value of these customers to the platform. These complex pricing arrangements provide an opportunity for rival platforms to divert customers by offering better prices. Meeting competition clauses could reduce the risk the platform faces from the loss of critical mass and by reducing that risk, they encourage the firm to make investments in improving the platform in ways that ultimately benefit consumers. Unlike single-sided firms multi-sided platforms cannot avoid the risks of losing customers by charging prices equal to marginal costs. Platforms may not be able to reach critical mass with marginal cost pricing and in any event marginal cost pricing does not maximize the value of the platform for consumers.

3. Tying and Bundling

The literature has provided a number of explanations for why tying and bundling could increase the welfare of the customers who are purchasing the tied or bundled products.³⁰ These explanations apply to the customers of multi-sided platforms as well.

There is an additional justification for multi-sided platforms. There may be situations in which customers on side A benefit when customers of side B are using an additional product or service provided by the platform. For example, an ecommerce platform might require merchants to use its payment platform thereby bundling both matchmaking and payment services together. Doing so might make it easier for consumers to pay efficiently. To take another example, a newspaper might require consumers to take multiple sections. That benefits advertisers who obtain more inventory for the fixed cost of printing and delivery the paper to the consumer as well as additional methods of targeting advertisements based on which consumers read each section.

4. Behavioral Restrictions and Standards

Multi-sided platforms impose constraints on the behavior of platform participants.³¹ They also sometimes have well-developed governance structures for detecting, adjudicating, and punishing violations of platform rules. Many of these rules appear to be designed to prevent members from imposing negative externalities on other members. These rules include ones that encourage platform members to provide reliable information, to meet their commitments to trading partners, not to engage in various kinds of opportunistic behavior, and other actions that either

limit negative externalities or increase positive externalities. For example, eBay imposes a variety of rules on both buyers and sellers on its ecommerce platform and can expel customers from the platform that violate those rules.³²

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BENEFIT CONSUMERS.

In some cases multi-sided platforms impose constraints that reduce the welfare of some users but increase the welfare of other users. Hagiu and Jullien, for example, show that platforms sometimes increase the search costs for consumers to benefit merchants.³³ Shopping malls, for example, are often designed to maximize the foot traffic to stores and in the course of doing so increase the time it takes consumers to find and go to a particular store destination.

Platforms also impose standards on one or both groups of customers. These could be technological standards such as the requirements that payment networks impose on merchants that accept their care, standards for presenting information such as those that Facebook imposes through its design of its pages, and process standards such as those using by physical exchanges for signaling whether an offer has been accepted.

In some cases competition authorities and courts have argued that some of these behavioral restrictions and standards are vertical constraints because they limit the ability of the customers to deal with rivals. The example of payment card systems is instructive. These systems have historically had rules that prohibit merchants that have agreed to accept their cards from imposing surcharges on customers that pay with those cards. Competition authorities and regulators have argued that these no-surcharge rules are anticompetitive because they limit the ability of merchants to steer consumers towards competing payment systems.³⁴

Although the no-surcharge rule may impose costs on some merchants it provides benefits to consumers who receive certainty about the prices they will pay when they use their cards. Consumers also receive protection against opportunistic behavior by merchants, for example, that assess a surcharge on consumers who do not have an alternative form of payment. In fact, while some competition authorities and regulators have banned surcharges other countries have passed legislation prohibiting merchants from imposing surcharges.³⁵ There is evidence that merchants have in fact used the ability to impose surcharges to engage in price discrimination and charge consumers opportunistically.³⁶

Of course, whether vertical restraints make platforms more efficient and benefit consumers depends on the facts of the particular situation in which these restraints are being used. The same holds true for the anticompetitive effects to which we now turn.

IV. ANTICOMPETITIVE USE OF VERTICAL RESTRAINTS BY MULTI-SIDED PLATFORMS

Economists have developed a variety of models that examine the effect of vertical restraints.³⁷

These models are typically based on a variety of assumptions that may or may not apply in any specific market. It is well known that the results of these models are sensitive to these assumptions. The single-monopoly profit theorem finds that a monopoly cannot obtain an additional profit by leveraging its monopoly in one good to a good that is supplied competitively. That conclusion strictly holds only when the two goods are consumed in fixed proportion. Economists have developed various models of how tying could reduce social welfare when the two goods are consumed in fixed proportions. Those theories find that tying necessarily reduces social welfare only under specific assumptions such as the existence of scale economies in the production of tied good.³⁸

The main theoretical models concerning the possible procompetitive and anticompetitive uses of vertical restraints assume, explicitly or implicitly, that the businesses considered are single-sided. They may provide some insights into possible procompetitive or anticompetitive aspects of vertical restraints by multi-sided platforms. Unfortunately, there is no guarantee that any of the key findings of these vertical-constraint theories will necessarily apply to multi-sided platforms that have several groups of customers with interdependent demand. For example, engaging in tying on one side of a platform could affect demand on the other sides of platform in a variety of way that are not incorporated in the standard theories of tying in the face of fixed or variable proportions.

A few authors have extended models originally developed to study vertical constraints by one-sided firms to consider the effects of those practices or similar ones when engaged in by multi-sided platforms. We provide an overview of some of this work and then examine its application to considering the anticompetitive effects of vertical restraints. Like the standard theories, however, these theories yield sharp predictions of the effect of vertical restraints on consumer and social welfare under very specific and difficult to verify assumptions.

A. Tying And Bundling

Whinston showed that in the presence of scale economies in the market for good B, a monopoly seller of good A would, under some conditions, find it profitable to employ tying contracts to become a monopolist in the B market.³⁹ He found that whether or not this reduces social welfare depends on the details of the situation. Does this one-sided analysis apply to multi-sided firms? Not surprisingly, adding sides adds a layer of complexity.

Amelio and Jullien consider a two-sided case in which tying is both profitable and increases consumer welfare.⁴⁰ Suppose the profit-maximizing price on one side of the business is less than zero but that it is not feasible actually to charge a negative price. By bundling another good, however, it is possible to make the effective price negative. They show that this practice increases consumer welfare in the monopoly case although it may not increase consumer welfare when there is competition.

Choi presents a model that is designed to capture the facts of an antitrust claim against Microsoft.⁴¹ The company included Windows Media Player with its Windows software platform.⁴² In Choi's model, two platforms, A and B, link content providers with consumers. Platform A also produces a product M, which must be purchased in order to use A or B. He as-

sumes that content providers multi-home, and therefore make their content available on both A and B. If consumers single-home, tying A to M will exclude B but may increase welfare if network effects are strong (so there is a large efficiency gain from having more customers on both sides of A) and consumers do not consider A and B to be very different (so the reduction in variety from eliminating B is small). If consumers also multi-home, however, tying A to M does not exclude B (there are no economies of scale), and social welfare is higher necessarily. This analysis makes clear the importance of understanding where multi-homing occurs and, even if it is not observed, why it does not occur.

THERE IS NO GUARANTEE THAT ANY OF THE KEY FINDINGS OF THESE VERTICAL-CONSTRAINT THEORIES WILL NECESSARILY APPLY TO MULTI-SIDED PLATFORMS THAT HAVE SEVERAL GROUPS OF CUSTOMERS WITH INTERDEPENDENT DEMAND.

Chao and Dertinger investigate mixed bundling, which involves selling the products individually and together at a discount over the separate prices.⁴³ Consider a monopoly video game platform that is considering a mixed bundling strategy: offering a bundle consisting of a console and some games as well as selling the console alone and allowing video game developers to sell games by themselves. Ignoring indirect network effects, one would expect that the optimal mixed bundling strategy would have higher prices for both the console and games than would be optimal if the bundle were not offered, since the bundle enables the firm to segment the market according to the number of games they prefer to consumer. These authors present a model in which network effects make it is optimal to reduce both console and game prices if a bundle is offered. Mixed bundling here acts as a price discrimination device, as in one-sided models, and the presence of the bundle reduces the cost of cutting console and game prices in order to encourage participation by both consumers and developers.

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B. Exclusive Dealing

The *Dallas Morning News* and the *Dallas Times Herald* were competing newspapers in Dallas, Texas. They both obtained content such as columns and comic strips from the Universal Press Syndicate. In August 1989 the *Morning News* signed an exclusive contract with Universal. *The Times Herald* subsequently lost readership. It filed an antitrust case, and lost.⁴⁴ In 1991, the parent company of the *Morning News* bought the *Times Herald* and shut it down. Chowdury and Martin use this example to motivate their analysis of exclusive dealing contract that deny platform rivals access to a key complementary input. They show that if consumers do not have strong preferences for one paper over the other and if fixed costs are substantial, social welfare may be higher with the exclusive contract. Consumers are always worse off in this model.

In the presence of significant economies of scale, Segal and Whinston have demonstrated that an incumbent monopoly can profitably deter the entry of a more efficient rival by persuading sufficient customers to sign exclusive dealing contracts before the entrant appears. Doganoglu and Wright investigate the effectiveness of this strategy when there are no economies of scale but direct or indirect network effects are present. In the case of a two-sided platform with indirect network effects, they find that it is profitable for the incumbent to exclude a more efficient entrant by offering attractive exclusive dealing contracts to one side of the market before the entrant appears and then charging high prices to those on the other side. As in the

single-sided case with scale economies, exclusive dealing deters entry by making it impossible for the potential entrant to obtain sufficient customers to be viable. Locking up either side of the market will make it impossible for an entrant to obtain customers on the other side. The platform does not have to lock up all of the one side for this result—it just needs to lock up enough to prevent profitable entry. Exclusive dealing reduces consumer welfare in this case.

Both of these analyses focus on the situation in which the platform with the exclusive dealing arrangement is an incumbent. As noted above other authors have shown that exclusive dealing arrangements are helpful for platforms to break into a market. Exclusive dealing arrangements enable entrants to break competitive-bottleneck equilibria in which customers single home on incumbent platforms. The use of exclusive dealing arrangements to secure critical mass raises some complexities for competition policy analysis. A platform may have entered into exclusive dealing contracts during the process of dynamic competition. Therefore the grounds for these contracts may well have been procompetitive. That leaves an issue of whether it should be allowed to maintain these contracts if it becomes the dominant platform. We discuss that issue in the next section.

C. Conditional Rebates, Meeting Competition And Other Vertical Restraints

The multi-sided platform literature has not analyzed many of the other types of vertical restraints. However, conditional rebates and some other types of vertical restraints could be used to raise the cost to customers of either multi-homing with rival platforms or single homing on a rival platform. One might expect that these restraints would have effects similar to exclusive dealing. They present the risk that these restraints might deter the profitable entry of a more efficient platform or one that is valuable because it is differentiated from the incumbent.

V. VERTICAL CONSTRAINTS, CRITICAL MASS, AND EXCLUSIONARY STRATEGIES

The concern over the anticompetitive use of vertical restraints to prevent rival platforms from achieving critical mass is not new. It was raised in the late 1990s in the antitrust literature concerning network industries.⁴⁵ Carl Shapiro, for example argued that “exclusionary contracts and exclusive membership rules can be especially pernicious in network industries, posing a danger that new and improved technologies will be unable to gain the critical mass necessary to truly threaten the current market leader.”⁴⁶ The multi-sided platform literature provides a more nuanced and richer treatment to the role of exclusive contracts. In addition to providing a rigorous definition of critical mass it provides deeper insights into strategies that multi-sided platforms could use to prevent firms from reaching critical mass. However, it also provides additional perspectives on the procompetitive use of exclusive dealing contracts by multi-sided platforms. Finally, it shows that the analysis of indirect network effects and critical mass extends well beyond the high-technology industries focused on by the network effects literature.

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A. Critical Mass

One can think of platform entry and growth as consisting of two phases.⁴⁷ In the first “initiation” phase the platform develops a critical mass of users. In the second “growth” phase the platform relies on network effects to drive growth to a long-run equilibrium level that is determined by the profit-maximizing size of the platform given the state of competition, and product differentiation, in the industry.⁴⁸

Critical mass is the border between the initiation and the growth phase. Critical mass is the amount of demand on both sides that is sufficient to generate positive feedback effects. Once critical mass is reached an additional fully-informed user on side gets value from the platform, increases the value of the platform, and makes the platform attractive to an additional fully informed user on the other side. The positive-feedback effect process continues until the platform reaches its long-run equilibrium size.

The notion of critical mass for platforms is similar to the well-known issue of liquidity in trading environments.⁴⁹ A trading venue is viable only if there is a sufficient volume of bids and asks for trading to occur and therefore for both liquidity providers and liquidity takers to incur the expense of coming to the trading platform. If there is too little liquidity buyers and sellers will not come to the platform. If there is enough liquidity more buyers and sellers will come and the platform will in fact grow and the platform will be attractive to market specialists and other liquidity providers.

During the initiation phase the platform engages in strategies to reach critical mass. From the standpoint of formal economics this is, for now, a block box. In practice, platforms use a combination of securing the participation of early adopters who like trying new things, trying to get users who place particularly high value on the platform, promotional offers, securing marquee customers who are particularly attractive to the other side, and aggressive marketing and promotion to get word of mouth. They also may engage in a variety of communications to shape the expectations of users that they are likely to achieve critical mass that provide these users with value.

Based on casual evidence it appears that most new platforms do not make it through this initiation phase.⁵⁰ They never achieve critical mass and die. The economics of critical mass explains what happens. Platforms that cannot achieve critical mass do not get to the point where there are self-perpetuating positive feedback effects. Instead, customers that have joined the platform on one side realize from experience that the platform does not have enough customers on the other side to make participation in the platform worth their while. Early adopters, high-valued users, and people who expected that the platform would achieve critical mass therefore abandon the platform. Growth towards critical mass slows and eventually reverses itself as platform participants abandon it. Although the economic models do not make it possible to put a time frame on the initiation phase it is obvious that it is limited. The customers that join during the initiation phase will only give the platform so much time before they abandon it.

Entering into exclusive dealing contracts is one of the strategies that platforms would want to consider during this initiation phase. These contracts enable the platform and guarantee participation one side of the platform. That demand attracts members on the other side

since participation in the platform is the only way for members on the other side to access these customers.

B. Vertical Restraints And The Platform Initiation Phase

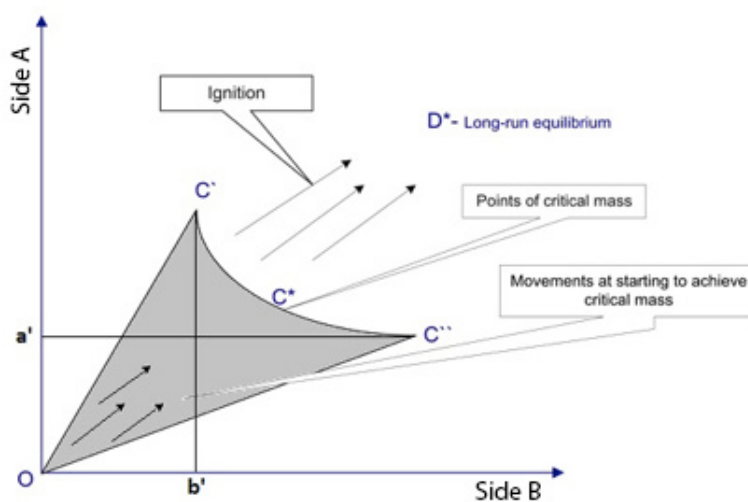
Incumbent platforms could adopt strategies that make it difficult for new platforms to reach critical mass during the initiation phase. Entrants would fail. Moreover, knowledge of these strategies, together with perhaps observing past failures, could dissuade other firms from entering and from investors funding startups in this area. Incumbent platforms could use vertical restraints to make it difficult for new platforms to attain critical mass.⁵¹

Vertical restraints could discourage customers from multi-homing in favor of single homing on the incumbent platform that has imposed the vertical restraints. Vertical restraints could also discourage customers from abandoning the incumbent platform altogether and single homing on a rival platform.

Exclusive dealing contracts could prevent new platforms from obtaining enough members on either side to attain critical mass. Platforms could enter into agreements that preclude customers from also participating in another platform. Conditional rebates and meeting competition clauses could accomplish the same result less directly. Conditional rebates would provide financial disincentives to reduce volume and in the extreme case could make it uneconomical to move modest portions of volume to a rival platform. Meeting competition clauses on the other hand would give the incumbent platform the opportunity to beat the rival's terms.

Vertical restraints would not need to foreclose the new platform from all demand on either side. It just needs to prevent the new platform from securing enough demand to reach critical mass. Figure 2 outlines the typical situation for platforms.

Figure 2: Critical Mass and Entry Deterrence



Vertical restraints would prevent a platform from reaching critical mass if these restraints prevented the platform from attaining enough demand on any side—that is more than

b' on side B or more than a' on side A. Vertical restraints would also prevent a platform from reaching critical mass if these restraints prevented the platform from attaining any more combination of demand shown by the shaded area in the cone to the southwest of the critical mass frontier.

The greatest obstacle for a new platform that is trying to secure critical mass is being prevented from pursuing the various strategies that would be most helpful in getting to critical mass. Therefore if particular groups or constellations of customers would be useful in getting to critical mass during the initiation phase vertical restraints that prevent those particular groups from joining the new platform would be most effective. Those could be marquis customers. Similarly, if a new platform would consider entering into exclusive deals with some set of customers vertical restraints that prevent or deter those customers from doing so would be most damaging to the new platform.

In both cases it is possible that the vertical restraints could deter the entrant from attaining critical mass by preventing the entrant from securing enough demand on any side. An incumbent platform could, for example, enter into exclusive contracts with “enough” of the potential members of one side of a platform. Platforms typically have a side that is more valuable and this is the side that is usually charged to a lower price. Locking up demand on that side would appear to be the most effective way to block an entrant. An incumbent platform could take a different approach. There may be situations in which groups of customers on various sides account for a disproportionate share of positive feedback effects. These are the most valuable customer segments for the platform. The platform could try to lock up as many of these key customer groups as possible through a variety of contracts.

Entrants are obvious targets because they cannot survive, let alone grow, if they do not achieve critical mass. However, it is possible for incumbents to employ tactics that could drive other incumbents, who already exceed critical mass, out of business. A particular target could be platforms that have surpassed critical mass and are in their growth phase towards their long-run equilibrium size. Let us refer to the incumbent that employs the strategy the predator and the rival the prey. The predator could enter into vertical restraints with its customers to deter them from working with a rival and then poach enough customers from its rival—possibly at terms that would be unprofitable for the rival—to drive the prey below critical mass.

C. Product Differentiation And Exclusionary Strategies

The older network effects literature often assumed that direct or indirect network effects would lead one firm to capture the market as a result of efficiency, luck, or anticompetitive strategies. Looking across the wide variety of industries with multi-sided platforms, all of which have indirect network effects to varying degrees, the empirical evidence does not support that concern. As noted earlier most industries that have multi-sided platforms appear to evolve to a situation in which several platforms compete with each other for customers. Product differentiation is one of the likely reasons for the ability of several platforms to compete with each other despite having much in common in what they are doing.⁵²

We would expect that businesses that want to compete with existing platforms would try to differentiate their platform. That makes sense for two related reasons. The first is that a new

platform would have trouble competing with an existing platform if it was truly a copycat.⁵³ The existing platform would provide more value to users because it has both sides on side and has gotten critical mass. Although the new platform could engage in price competition at similar prices, the incumbent platform would always be better. The second reason, though, is that by differentiating itself a new platform would have an easier time achieving critical mass. It would be able to attract early adopters and high value users who are particularly attracted to its differentiated service. It would also be able to enter into exclusive deals at a lower cost since it would not necessarily be competing to the same desirable customers as the incumbent platform.

The older network effects literature expressed significant concern that networks could engage in exclusionary strategies, especially exclusive dealing contracts, to prevent entrants from challenging them. They would therefore be able to attain secure monopoly positions. The existence of product differentiation tempers the concern in two ways. First, as an empirical matter it does not appear that incumbent platforms have in fact kept out competition in most multi-sided platform industries. Second, product differentiation appears to be a useful counterstrategy to vertical restraint strategies deployed by incumbents.

D. Procompetitive Vertical Restraints

The fact that an incumbent platform has vertical restraints and that these vertical restraints make it harder for an entrant to achieve critical mass does not necessarily mean that these restraints are anticompetitive. The incumbent platform may have adopted these restraints to achieve efficiencies that benefit consumers. These benefits may outweigh the harm that consumers incur from deterring entry and growth of new platforms. We return to our discussion of the procompetitive use of vertical restraints in light of the analysis of critical mass.

1. Vertical Restraints and Static Efficiencies

Vertical restraints including exclusive dealing contracts could be used by the platform to ensure that it retains critical mass in the face of competition. In some cases the platform may have adopted exclusive dealing during its initiation phase and continued these after it achieved critical mass and reached long-run equilibrium. But it may continue these contracts because dropping them would raise the risk of those customers being lured to other platforms that offer exclusive deals. In other cases it might adopt new exclusive dealing contracts to reduce the risk of losing sufficient demand to attract the other side. Either way, if a sufficient number of customers left, the platform could see positive feedback effects work in reverse and it could fall below the level necessary for critical mass.

It is also possible that some customers on one side use their value to the platform to threaten to go to another platform in the absence of price or other concessions. The obvious bargain to strike with such customers is one in which the platform provides low prices, or subsidies, in return for a commitment on the part of these customers to make themselves available exclusively to the customers on the platform, or not to pay higher prices to other platforms. As Armstrong and Wright point out, it is the customers that comprise the competitive bottleneck that may ultimately benefit from exclusive dealing.

Customers on the opposite side of the customers who have an exclusive contract may benefit from these exclusive dealing contracts as well. These customers have a guarantee that certain counterparties that they would like to interact with will be available on the platform. That increases the expected thickness of the market they will have available to them on the platform. It also enables them to reduce the costs of searching for these potential counterparties to trades on other platforms. Customers can avoid some of the costs of multi-homing. Customers on the same side as the customers who have exclusive contracts may benefit from these contracts as well. They know that the customers with exclusive contracts will attract customers on the other side and they will therefore be able to interact with those customers. A useful example is a dating venue. It is common for nightclubs to recruit “cool” people to ignite their venues. The presence of the “cool” guys attracts women with whom both the cool and uncool guys can then interact with.

Generally, as mentioned earlier, vertical restraints could be natural elements of the strategies that platforms adopt to manage the positive and negative externalities that ultimately determine the value of the platform to the customers on the several sides.

2. Vertical Restraints and Dynamic Efficiencies

Multi-sided platforms face the same risks that all businesses do in entering a new category. Especially if they are the initial innovator they face uncertainty over whether there is sufficient demand to create a viable business and whether more efficient competitors will appear that will destroy their investment value. They have to incur the risks inherent in discovering demand and learning how to design an efficient and profitable business. But in addition, multi-sided platforms face considerable risks in whether they will be able to secure critical mass. That is especially the case for platforms that must have both sides on board simultaneously. They have a limited time to get to critical mass. Their primary challenge is they are necessarily offering a service that is probably not valuable in its early stages to customers simply because there are not enough customers on board the platform early on. That is very unlike the startup phase for single-sided businesses that generally start with a product or service that is valued by consumers.

Building up critical mass means assembling groups of customers that together create value to ignite positive feedback effects. A platform that does this successfully may provide something of a roadmap to other potential platform competitors. These rivals could free ride on the platform’s success in identifying the right types of customers to get on its platform during the initiation phase. Vertical restraints could be used to make it harder for competitors to free ride in this way. The benefits and costs of allowing a platform to protect the customer base it has assembled are similar to other kinds of intellectual property. The benefits result from providing incentives to develop innovative solutions to securing critical mass and ignition for a new platform business and discouraging free riding that could reduce if not eliminate those incentives. The costs result from the increased market power that a successful platform entrant would then have as a result of being able to discourage rivals.

3. Vertical Restraints During Common Initiation and Growth Phases

The multi-sided platform literature shows that as a matter of theory exclusive dealing contracts are helpful for entrants to break competitive bottleneck equilibria. Empirical result has documented that these contracts were valuable for entrants in the video game console industry. The contracts also have a number of other benefits in terms of helping platforms build critical mass as we have discussed. It is therefore not surprising to see these contracts and similar vertical restraints that bind customers being used by multi-sided platforms.

Assessing whether these arrangements are anti- or procompetitive is a particularly difficult exercise during the startup phase of an industry. During this period many multi-sided platforms may be entering and going through initiation and growth phases. Long run equilibrium for any of them may be a ways off. Unfortunately, competition authorities and courts do not necessarily know which stage the industry is in. The leading firm may be at an early stage in growth and not that far away from the critical mass boundary. A better-financed firm may be at the critical mass phase. It is far from clear that intervention in these circumstances to prohibit exclusive contracts by the leading firm would result in the industry moving to a long run equilibrium that is superior for consumers. That could destabilize the leading firm while giving the entrant an artificial advantage.

VI. CONCLUSIONS

This review of vertical restraints by multi-sided platforms has identified several aspects of these platforms that competition analysis should take into account to assess the procompetitive and anticompetitive aspects of these restraints.

First, where the platform is in its life cycle and where the platform and its rivals are in the lifecycle of the industry are important considerations. Exclusive dealing and other similar vertical restraints that bind customers to the platform are more likely to be procompetitive practices, or at least the residue of procompetitive strategies, during the initiation and early growth stages of platforms are during the early parts of the lifecycle of platform industries. This point argues for avoiding antitrust interventions during the early years of an industry.

Second, in assessing whether vertical restraints on one side of a platform generate efficiencies, it is important to look at the impact of these restraints on the other sides of the platform. These restraints could provide customers on the other side with the benefits of knowing that particular kinds of customers they want to interact with are available on the other side. They could also provide various other benefits as we saw when customers on one side benefit from the customers on the other side having a tied product.

Third, in assessing whether there are procompetitive benefits of vertical restraints it is important to consider their role in harnessing positive and negative externalities in ways that increase platform value. Vertical restraints could help increase positive network effects and also limit customers on one side from engaging in behavior that harms customers on the other side.

Fourth, in assessing whether vertical restraints could foreclose a rival it is important to assess the impact of the restraints on the ability of the rival to reach critical mass. That will or-

dinarily involve examining the types of customers that are foreclosed to the rival, their positive externalities with customers on the other side of the platform, and their overall importance in moving the platform to critical mass.

Fifth, one cannot take the implications of formal economic models of anticompetitive restraints that were developed for traditional industries and assume that these implications apply to multi-sided platforms. The only reliable way to assess whether they do or not is to incorporate interdependent demand in these models and assess whether the implications are robust to that change.

Sixth, the literature on multi-sided platforms is relatively new as is the experience of courts and competition authorities in analyzing their practices using the lens of this new theory. Over time we would expect that developments in economics, both theory and empirics, and the experience with cases will find that multi-sided platforms can engage in anticompetitive strategies we have not yet identified and that some strategies that appear anticompetitive today will turn out to be benign.

So, one can be sure that this paper is not the last word on the subject. ◀

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1. Chairman, Global Economics Group; Lecturer, University of Chicago Law School; Visiting Professor, Faculty of Laws, University College London. Portions of this paper are based on joint work I have done with Richard Schmalensee. An earlier version of this paper was presented at the CEDES Conference on Vertical Restraints Adopted by Dominant Firms, in Brasilia, Brazil, and at a seminar organized by IBRAC/Mackenzie University in Sao Paulo Brazil. I would like to thank Howard Chang, Paulo Furquim de Azevedo, participants in the preceding seminars for helpful comments and Steven Joyce for excellent research help. I retain sole ownership of any errors.
 2. See, e.g., MASSIMO MOTTA, *COMPETITION POLICY: THEORY AND PRACTICE* 302-410 (2004).
 3. See PHILIP E. AREEDA AND HERBERT HOVENKAMP, *ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION* Chapters 16-18 (2012); KEITH N. HYLTON, *ANTI-TRUST LAW: ECONOMIC THEORY AND COMMON LAW* 252-310 (2003).
 4. For a survey of this literature as it relates to antitrust see David S. Evans and Richard Schmalensee, *The Antitrust Analysis of Multi-sided Platform Businesses*, in *OXFORD HANDBOOK ON INTERNATIONAL ANTITRUST ECONOMICS* (Roger Blair and Daniel Sokol eds., forthcoming 2013), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2185373.
 5. Id.
 6. See, for example, European Commission, Decision of 24 May 2004 Relating to a Proceeding Pursuant to Article 82 of the EC Treaty and Article 54 of the EEA Agreement Against Microsoft Corporation (Case COM/C-3/37.792 – Microsoft), Official Journal L 032, 06/02.2007 P. 0023-0028.
 7. See Jean-Charles Rochet and Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 J. EUR. ECON. ASS'N 990 (2003). This paper started circulating in draft form around 2000.
 8. There is, however, an important related literature concerning exclusivity arrangements in networks. See David Balto, *Networks and Exclusivity: Antitrust Analysis to Promote Network Competition*, 7 GEO. MASON L. REV. 523 (1999); Carl Shapiro, *Exclusivity in Network Industries*, 7 GEO. MASON L. REV. 673 (1999).

9. There are likely specific issues relevant to an analysis of vertical restraints in any particular multi-sided industry or company that will not be reflected in this overview. Among other reasons, this overview largely reflects the multi-sided vertical restraints literature to date, which is a relatively new and developing literature.
10. See Rochet and Tirole, *supra* note 5.
11. See David S. Evans, How Catalysts Ignite: The Economics of Platform-Based Start-Ups, in *PLATFORMS, MARKETS, AND INNOVATION* (Annabelle Gawer, ed., 2009); David S. Evans and Richard Schmalensee, Failure to Launch: Critical Mass in Platform Businesses, 9 *REV. NETWORK ECON.* (2010). Earlier literature on direct and indirect network effects alluded to critical mass but did not provide any formal definition of analysis of it.
12. See Evans, *supra* note 8, for further discussion.
13. For example, when the Discover Card launched in 1986 it used the base of Sears store cardholders to secure customers on the card side and had the Discover Card accepted at Sears stores in addition to signing up many merchants to accept it at its launch as well. See DAVID S. EVANS AND RICHARD SCHMALENSEE, *PAYING WITH PLASTIC: THE DIGITAL REVOLUTION IN BUYING AND BORROWING* (2006).
14. See Evans and Schmalensee, *supra* note 8.
15. David S. Evans and Richard Schmalensee, Industrial Organization of Markets with Two-Sided Platforms, 3 *COMPETITION POL'Y INT'L* 151 (2007), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=987341.
16. See Rochet and Tirole, *supra* note 5.
17. See Özlem Bedre-Defolie and Emilio Calvano, Pricing Payment Cards (European School of Management and Technology and Bocconi University, Working Paper, 2012).
18. DAVID S. EVANS, ANDREI HAGIU, AND RICHARD SCHMALENSEE, *INVISIBLE ENGINES: HOW SOFTWARE PLATFORMS DRIVE INNOVATION AND TRANSFORM INDUSTRIES* (2006).
19. Andrea Galeotti and José Moraga-González, Platform Intermediation in a Market for Differentiated Products, 53 *EUR. ECON. REV.* 417 (2009) provide a model of a shopping mall that attracts horizontally differentiated retailers as well as consumers.
20. Hanna Halaburda and Mikołaj Jan Piskorski, Competing by Restricting Choice: The Case of Search Platforms (Harvard Business School, Working Paper No. 10-098, 2011).
21. David S. Evans and Richard Schmalensee, Industrial Organization of Markets with Two-Sided Platforms, 3 *COMPETITION POL'Y INT'L* 151 (2007), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=987341.
22. To use economic parlance, they are determined endogenously.
23. Of course, one would need to examine the facts of the particular case to assess whether these procompetitive benefits of vertical restraints exist and whether they outweigh possible anticompetitive effects. As is the case with vertical restraints generally there may be arguments as to why some vertical restraints should be presumed procompetitive and therefore treated as *per se* lawful.
24. In addition, the traditional explanations that have been advanced in the literature and case law for vertical restraints as to why vertical restraints may be procompetitive generally apply to multi-sided platforms as well. See, e.g., DENNIS W. CARLTON AND JEFFREY M. PERLOFF, *MODERN INDUSTRIAL ORGANIZATION* 396-412 (4th ed. 2005); MASSIMO MOTTA, *supra* note 1, at 306-347; Damien Geradin and Caio Mario da Silva Pereira Neto, For a Rigorous “Effects-Based” Analysis of Vertical Restraints Adopted by Dominant Firms: An Analysis of the EU and Brazilian Competition Law 11-16 (Tilburg University and Getulio Vargas Foundation, Working Paper, 2012), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2173735.

25. The traditional case of natural monopoly arises as a result of scale economies in cost. In this case the natural monopoly arises as a result of interdependent demand that result in the value of the platform to users being maximized when all users participate in the same platform. It is economically efficient to have a single platform— that is, there is a natural monopoly—so long as diseconomies of scale in costs do not outweigh the benefits of consolidating demand.
26. Or alternatively if the single platform can be regulated so that the benefits of having a single platform outweigh the direct and indirect costs of regulating it compared with having multiple competing platforms.
27. During the development of the industry platforms would compete on the terms of the vertical restraints and through this process of competition the most efficient platform would win the market. Once a platform has dominated an industry it may still need to maintain vertical restraints to prevent rivals platforms from attracting selected users and thereby reducing the overall welfare that the platforms can deliver.
28. For a discussion of commitment issues for video game platforms see Andrei Hagiu, Pricing and Commitment by Two-Sided Platforms, 37 RAND J. ECON. 720 (2006) and for an empirical analysis of exclusivity arrangements in this industry see Robin S. Lee, Vertical Integration and Exclusivity in Platform and Two-Sided Markets (Stern School of Business, Working Paper, 2012).
29. As discussed below, tests that involve examining the incremental profit from bundled rebates would need to consider the additional profit realized from positive feedback effects.
30. Christian Ahlborn, David S. Evans, and A. Jorge Padilla, The Antitrust Economics of Tying: A Farewell to Per Se Illegality, 49 ANTITRUST BULL. 287 (2004); David S. Evans and A. Jorge Padilla, Designing Antitrust Rules for Assessing Unilateral Practices: A Neo-Chicago Approach, 72 U. CHI. L. REV. 73 (2005); David S. Evans and Michael Salinger, Why Do Firms Bundle and Tie?, 22 YALE JOURNAL ON REGULATION 37 (2005).
31. David S. Evans, Governing Bad Behavior by Users of Multi-Sided Platforms, 27 BERKELEY TECH. L. J. 1201 (2012).
32. For guidance relating to the rules for buyers and sellers on eBay, see Rules & Policies, EBAY, <http://pages.ebay.com/help/policies/overview.html> (last visited Dec. 18, 2012).
33. For a general analysis of strategies in which platforms increase consumer search costs, see Andrei Hagiu and Bruno Jullien, Why do Intermediaries Divert Search?, 42 RAND J. ECON. 337 (2011).
34. RESERVE BANK OF AUSTRALIA, REFORM OF CREDIT CARD SCHEMES IN AUSTRALIA IV: FINAL REFORMS AND REGULATION IMPACT STATEMENT 38 (2002), available at <http://www.rba.gov.au/payments-system/reforms/cc-schemes/final-reforms/complete-stmt.pdf>
35. Countries that ban credit card surcharging include Austria, Fiji, France, Italy, Bulgaria, Latvia, Lithuania, the Philippines, Portugal, Romania, Slovakia, Sweden, and the United Arab Emirates. The Price of Paying by Plastic, WHICH? MAGAZINE, Oct. 2010, at 14, 14, reprinted in Which?, Super-Complaint: Credit and Debit Surcharges 107, submitted to Office of Fair Trading (UK) Mar. 30, 2011, available at <http://www.which.co.uk/documents/pdf/payment-method-surcharges-which-super-complaint-249225.pdf>; KPMG Fiji Islands, International Executive Alert (Oct. 3, 2012), <http://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/flash-international-executive-alert/Documents/flash-international-executive-alert-2012-176-oct.pdf>; Credit Card Surcharges Are Unlawful, Says DTI, ABS-CBN News, October 17, 2010, available at <http://www.abs-cbnnews.com/business/10/17/10/credit-card-surcharges-are-unlawful-says-dti>; UAE Bans Credit Card Surcharge from July 1, EMIRATES 24/7, June 6, 2011, available at <http://www.emirates247.com/news/emirates/uae-bans-credit-card-surcharge-from-july-1-2011-06-06-1.401405>. US states that ban credit card surcharges include California, Colorado, Connecticut, Florida, Kansas, Maine, Massachusetts, New York, Oklahoma, and Texas. Visa Inc., Visa Warns Consumers about Retailer Checkout Fees, http://usa.visa.com/personal/using_visas_checkout_fees/index.html (last visited Dec. 20, 2012). Countries that limit surcharging include Australia, Denmark, Germany, Greece, Hungary, and Spain. Which?, supra, at 14. The Reserve Bank of Australia recently changed its regulations, allowing the payment card networks to limit surcharging. RESERVE BANK OF AUSTRALIA, A VARIATION TO THE SURCHARGING STANDARDS: FINAL REFORMS AND REGULATION IMPACT STATEMENT (2012),

available at <http://www.rba.gov.au/payments-system/reforms/cards/201206-var-surcharging-stnds-fin-ref-ris/pdf/201206-var-surcharging-stnds-fin-ref-ris.pdf>. The European Union is moving toward limiting surcharges, and the UK is considering early implementation of this directive. Council Directive 2011/83/EU, 2011 O.J. (L 304) 64, 81 (EC), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0064:0088:EN:PDF>; Department for Business Innovation and Skills (UK), Consultation on the Early Implementation of a Ban on Above Cost Payment Surcharges, September 2012, available at <http://www.bis.gov.uk/assets/biscore/consumer-issues/docs/c/12-1008-consultation-ban-above-cost-payment-surcharges>.

36. Office of Fair Trading, Payment Surcharges (2012), available at http://www.offt.gov.uk/shared_offt/super-complaints/OFT1349resp.pdf; Reserve Bank of Australia, *supra* note 30, at 4-7.
37. For a survey see MOTTA, *supra* note 1.
38. Evans and Padilla, *supra* note 25.
39. Michael D. Whinston, Tying, Foreclosure, and Exclusion, 80 AM. ECON. REV. 837 (1990).
40. Andrea Amelio and Bruno Jullien, Tying and Freebies in Two-Sided Markets, 30 INT'L J. INDUS. ORG. 436 (2012).
41. Jay Pil Choi, Tying in Two-Sided Markets with Multi-Homing, 58 J. INDUS. ECON. 607 (2010).
42. European Commission (EC), Case COMP/C-3/37.792 Microsoft, March 24, 2004, available at http://ec.europa.eu/competition/antitrust/cases/dec_docs/37792/37792_4177_1.pdf; Ahlborn, Evans, and Padilla, *supra* note 25.
43. Yong Chao and Timothy Derdenger, Mixed Bundling in Two-Sided Markets: Theory and Evidence (University of Louisville and Carnegie Mellon University, Working Paper, 2012).
44. Times Herald Printing Co. vs. A.H. Belo Corp., No. A14-90-00856-CV (Texas App. – Houston [14th Dist.] November 27, 1991).
45. Balto, *supra* note 6; Shapiro, *supra* note 6.
46. Shapiro, *supra* note 6, at 674.
47. Evans and Schmalensee, *supra* note 8.
48. As noted earlier, temporally these two phases could collapse into a single point in time when the platform has secured commitments from a critical mass of customers and in effect opens for business at that point in time.
49. In fact critical mass for a trading environment corresponds to minimum liquidity. For a discussion of liquidity and critical mass see Larry Harris, TRADING AND EXCHANGES: MARKET MICROSTRUCTURE FOR PRACTITIONERS (2002); Maureen O'Hara, MARKET MICROSTRUCTURE THEORY (1995).
50. Of course it is well known that most entrepreneurs fail even in single-sided businesses. Critical mass is just another hurdle in multi-sided platform businesses.
51. They could also engage in predation which we do not discuss here.
52. The existence of congestion and diseconomies of scale in costs are other reasons.
53. Although as noted above congestion and diseconomies of scale could provide room for entry.