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The Empirics of Antitrust in Two-Sided Markets

Marc Rysman

Recent theoretical research on the implications of two-sided markets is gaining recognition for its implications in antitrust.[1] However, the role of empirical analysis in antitrust cases for two-sided markets has been unexplored thus far. Empirical tools of economics are playing an increasingly large role in antitrust litigation.[2] At the same time, there have been several recent attempts to bring empirical analysis to two-sided markets. To the extent that this empirical work on two-sided markets bares similarities to common empirical tools of antitrust, it can provide a template for how the empirics of antitrust cases will proceed in two-sided markets.

This paper studies several issues in which empirical contributions can impact antitrust in the context of two-sided markets. For each issue, I discuss recent empirical research that exemplifies my point. The first issue I discuss is the implementation of market simulations. Market simulations have an important role in determining relevant markets and the price effects of horizontal coordination.[3]

1 Overviews of the research literature in economics appear in J.-C. Rochet & J. Tirole, *Two-Sided Markets: A Progress Report*, RAND J. Econ. (Autumn 2006) and M. Armstrong, *Competition in Two-Sided Markets*, RAND J. Econ. (Autumn 2006). For discussions of the role in antitrust, see D. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20(2) Yale J. on Reg. (2003) and D. Evans & M. Noel, *Defining Antitrust Markets When Firms Operate Two-Sided Platforms*, 3 Colum. Bus. L. Rev. 667 (2005).

2 *See, e.g.,* J. Baker & D. Rubinfeld, *Empirical Methods in Antitrust Litigation: Review and Critique*, 1 Am. L. & Econ. Rev. 385 (1999) and R. Epstein & D. Rubinfeld, *Merger Simulation with Brand-Level Margin Data: Extending PCAIDS with Nests*, 4(1) Advances in Econ. Analysis & Pol'y (2004).

3 G. Werden & L. Froeb, *The Antitrust Logit Model For Predicting Unilateral Competitive Effects*, 70(1) Antitrust L.J. 257 (2002).

The author is Associate Professor at Boston University. He thanks David Evans for providing motivation and encouragement to write this paper. Participants at the Antitrust for Two-Sided Markets conference in Cambridge, MA, June 2006 provided valuable feedback.

However, in the context of two-sided markets, the investigator must specify substantially more demand parameters, and results can depend on small changes in certain parameters. This feature raises the issue of where these parameters come from, whether they are estimated from data or simply reflect informed guesses about industry features. I turn to the research described in my 2004 paper on the yellow pages market to provide a helpful example.[4]

The second tool taken up in this paper is price regressions. Price regressions can provide direct evidence on the relationship between market structure and pricing and has played an important role in some litigation. A prominent example is the merger of Office Depot and Staples.[5] Price regressions could potentially be applied in a two-sided context as well. There are naturally at least two prices in a two-sided market and the measure of market structure must account for possibly different market structures on each side of the market. For an example of how this method might proceed, I refer to my paper on sports card conventions (with Professor Ginger Jin).[6]

Whereas the first two issues represent examples of standard tools being adjusted for two-sided markets, the final part of the paper addresses new questions that arise in two-sided markets for which empirical research might be important. Naturally, this discussion is open-ended but I focus on two questions that seem important and potentially testable in data. The first is the basic question of whether or not a market is two-sided. Showing that a market is not two-sided may be difficult as there is no firm agreement on the definition, and some definitions are quite broad. However, markets that exhibit positive feedback loops (or indirect network effects) are two-sided under any definition.[7] Establishing such a feedback loop would be strong evidence in favor of the relevance of two-sided markets. A second question that can be important is whether or not agents multi-home, that is, whether they interact with more than one intermediary. In forthcoming papers, Professors Rochet and Tirole and Professor Armstrong establish the importance of multi-homing in determining pricing structure.[8] If a group of agents single-home, the intermediary has market power over access to its agents. That can lead to relatively high prices for the other side of the market and very competitive pricing for the single-homing agents. In an upcoming

4 M. Rysman, *Competition between Networks: A study of the Market for Yellow Pages*, 71(2) Rev. Econ. Stud. 483 (2004).

5 For discussion, *see* S. Dalkir & F.R. Warren-Boulton, *Prices, Market Definition, and the Effects of Merger: Staples-Office Depot*, *in* The Antitrust Revolution: Economics, Competition, & Policy 52-72 (J. Kwoka, Jr., & L. White eds., 2004).

6 G. Jin & M. Rysman, Platform Pricing at Sports Card Conventions (2006).

7 *See* J. Farrell & G. Saloner, *Standardization, Compatibility, and Innovation*, RAND J. Econ. 70 (1985).

8 Rochet & Tirole (2006), *supra* note 1 and Armstrong, *supra* note 1.

paper, I test for both of these issues in a detailed data set covering the payment card industry.[9]

The list of issues covered here is not meant to be exhaustive. The general point is rather that empirical research on the economics of two-sided markets is relevant in antitrust settings. The theoretical literature on two-sided markets is new and typically, empirical work lags behind theory. While that may be the case, empirical research has progressed far enough to provide models for how empirical analysis should proceed in antitrust litigation when issues associated with two-sided markets are important.

I. Market Simulations

Market simulations provide a method for assessing the anticompetitive impacts of mergers and horizontal collusion. More detailed descriptions appear in Werden and Froeb's 2002 paper and Epstein and Rubinfeld's 2004 paper, but the standard analysis specifies a demand system for a set of products and an ownership structure.[10] Specifying demand means determining own-price and cross-price elasticities. The investigator must also specify how firms interact. Formally, the interaction is a game theoretic equilibrium solution concept, and typical examples are to assume that firms set prices simultaneously or that they set quantities simultaneously. Given these assumptions, the investigator can map observed market shares and prices into implied marginal costs, that is, the marginal costs that rationalize the observed market outcome. With these elements in hand, the investigator can specify alternative market structures, such as one in which one product exits the market or a set of products switch from one firm to another. The investigator calculates prices and quantities under the new market structure and may be interested in whether prices rise by more than 5 perecent or consumer surplus significantly changes.

There has been little research explicitly validating these models ex post. Also, to my knowledge, simulation models have not been presented as evidence in an antitrust proceeding. However, simulation models are increasingly popular at competition authorities as a screening tool for determining which mergers should be challenged.[11] Arguably, the appearance of simulations in court is not far away.

One important tension in this approach is where the parameters come from, particularly the elasticities. The economics literature provides numerous examples of estimation from data using econometric techniques. However, competition

9 M. Rysman, *An Empirical Analysis of Payment Card Usage*, J. Indus. Econ. (forthcoming 2007).

10 Werden & Froeb (2002), *supra* note 3 and Epstein & Rubinfeld, *supra* note 2.

11 G. Werden & L. Froeb, *An Introduction to the Symposium on the Use of Simulation in Applied Industrial Organization*, 7(2) Int'l J. Econ. Bus. 133 (2000).

authorities rarely have the data or time available to rigorously pursue these techniques. Rather, these investigators are often in the position of having to make educated guesses at these parameters, and presenting results for a range of parameters. For instance, Werden and Froeb say that "We do not view high quality and elaborate econometrics as prerequisites ... based out of necessity of just informed guesses and intuition."[12]

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Two-sided markets bring up several new challenges. Firstly, there are normally at least two markets interacting. Naturally, that implies the investigator must provide own and cross-price elasticities for each market. Crucially, the investigator must also specify how the two markets interact. For instance, the videogame console market is thought of as two-sided because game producers will develop games for a console if consumers purchase the console and consumers purchase the console if there are a large variety of games to choose from. To provide a simulation of the console market, the investigator must specify the standard price responses: how consumers respond to prices of different consoles, and how developers respond to developer fees. However, it is also necessary to specify the strength of the consumer response to an increase in games, and the strength of the response of game producers to consumer adoption. These network-effect parameters can be crucial to the predicted outcome, but estimating them requires data on two markets and is still often subject to questions about endogeneous determination of the outcomes in complementary markets. Further, guessing at these parameters is difficult. Investigators are likely to have some experience with guessing price elasticities in different markets and market participants have good incentives to learn price elasticities relatively accurately. However, network-effect parameters fall outside of the experience of most investigators and market participants are unlikely to know them beyond a general sense that network effects are strong or weak.

A second problem is that dynamics are typically very important in two-sided markets. Most discussions of simulations in merger contexts only discuss static models. Naturally, they must be applied to industries for which dynamics do not play too important a role. But two-sided markets are often characterized by tipping and aggressive penetration pricing, for which a dynamic model is more appropriate. Conceptually, it is feasible to introduce dynamics into simulation.[13]

12 *Id.*

13 *See, e.g.*, A. Pakes & P. McGuire, *Computing Markov-Perfect Nash Equilibria: Numerical Implications of a Dynamic Differentiated Product Model*, RAND J. ECON. 555 (1994). For airlines, *see* L. Benkard, *A Dynamic Analysis of the Market for Wide-Bodied Aircraft*, 71(3) REV. ECON. STUD. 581 (2004). For a general model of network effects, *see* M. Mitchell & A. Skrzypacz, *Network Externalities and Long-Run Market Share*, 29(3) ECON. THEORY 621-48 (2006).

But in practice, doing so is a major computational undertaking and will often not be a reasonable option as part of the merger review process.

A third issue to keep in mind is that the link between prices and quantities is often more ambiguous in two-sided markets. For instance, it is often possible for consumers and sellers to rationally not utilize an intermediary if the other side does not, even if price is low. In that case, the traditional focus of the U.S. merger guidelines on price effects (in particular the SSNIP test)[14] may be misguided.

To see the importance of these issues, consider my 2004 paper which studies the market for yellow pages.[15] In their 2006 paper, Kaiser and Wright take a similar approach to study price-cost markups in the magazine industry.[16] Yellow pages are a two-sided market because consumers value a directory based on how much advertising is in the directory and advertisers demand advertising based on consumer usage, leading to a positive feedback loop. A publisher determines the price and quantity of advertising (and other features) taking into account how readers will respond. I model the two-sided market as two simultaneous equations, one to represent consumer demand and one to represent advertiser demand. Stripped to essentials, the model is as follows. In the paper, I specify consumer usage of book j as a function of how much advertising appears in books j and in the competitors of the book, indexed as $-j$:

$$Usage_j = f(Advertising_j, Advertising_{-j}, X_j^U) \quad (1)$$

Naturally, one would expect $Usage_j$ to increase in $Advertising_j$, which represents the first half of the network effect. Also, $Usage_j$ should decrease in $Advertising_{-j}$. Here, X_j^U refers to consumer demographics, such as education level and income.

Advertiser demand is specified as follows:[17]

$$Advertising_j = g(Price_j, Usage_j, X_j^A) \quad (2)$$

This equation states that the quantity of advertising at directory j is a function of the price of advertising at directory j and the consumer usage of directory j. Advertising should increase in usage, which represents the second part of the network effect. The relationship between advertising and price represents the

14 SSNIP is an abbreviation for a small but significant non-transitory increase in price.

15 Rysman (2004), *supra* note 4.

16 U. Kaiser & J. Wright, *Price structure in two-sided markets: Evidence from the magazine industry*, 24(1) Int'l J. Indus. Org. 1 (2006).

17 In fact, in my paper I specify Equation 2 with price on the left-hand side and quantity of advertising on the right-hand side. Doing so has some technical advantages for purposes of estimation, but I believe that seeing the Equation 2 with quantity on the left-hand side is more intuitive. (Rysman, *supra* note 4).

standard relationship between quantity and price in any demand curve and should be downward sloping. Generically, the quantity at directory j should be a function of prices at all competing directories, but I argue that this effect can be assumed away in the yellow pages market, and I test this assumption. Also, X_j^A represents consumer demographics that affect advertising demand, such as income.

Finally, in the paper I specify a third equation that determines how a publisher sets prices. Following standard oligopoly theory, I assume that publishers set marginal revenue equal to marginal cost taking their comepetitors' choices as given:

$$\textit{Marginal Revenue}(\textit{Advertising}_j, \textit{Advertising}_{-j}, \textit{Usage}_j, X_j^U, X_j^P) = MC_j \qquad (3)$$

This equation is largely for purposes of identifying marginal cost, which contributes to later calculations.

Note that studying the yellow pages market simplifies a number of issues. Consumers do not pay to use yellow pages directories, which not only implies that there are no prices in Equation (1) but also eliminates the equation that determines the price on the consumer side. Another simplification that is realistic for yellow pages is that consumers value all advertising. In many media markets, consumer valuation of advertising is ambiguous. For instance, newspaper consumers may attach positive value to local and classified advertisements but negative value to national advertisements, and then there is the further valuation of editorial content. In his 1970 paper, Rosse specifies a model with five equations to study newspapers.[18] Finally, the yellow pages market is relatively mundane and established, at least when compared to many of the markets that might be considered two-sided. It is reasonable in this case to specify a static model and ignore such issues as consumer learning over time.

In my 2004 paper, I estimate this model on a data set of 419 directories in a several metropolitan statistical areas. The model considers diary data of consumer usage as well as a number of prices and the number of pages in each directory, which proxies for quantity. The result is a statistically and economically significant positive feedback loop, both that advertising affects usage in Equation (1) and that usage affects advertising in Equation (2).

As an application, I consider what would happen if the number of directories were to increase exogenously. For these purposes, I turn to simulation in the spirit of Werden and Froeb.[19] Because the estimation procedure finds that directories are close substitutes from the point of view of consumers, switching from monopoly to duopoly leads to massive price decreases and advertising increases as a way

18 J. Rosse, *Estimating Cost Function Parameters Without Using Cost Data: Illustrated Methodology*, 38(2) Econometrica 256 (1970).

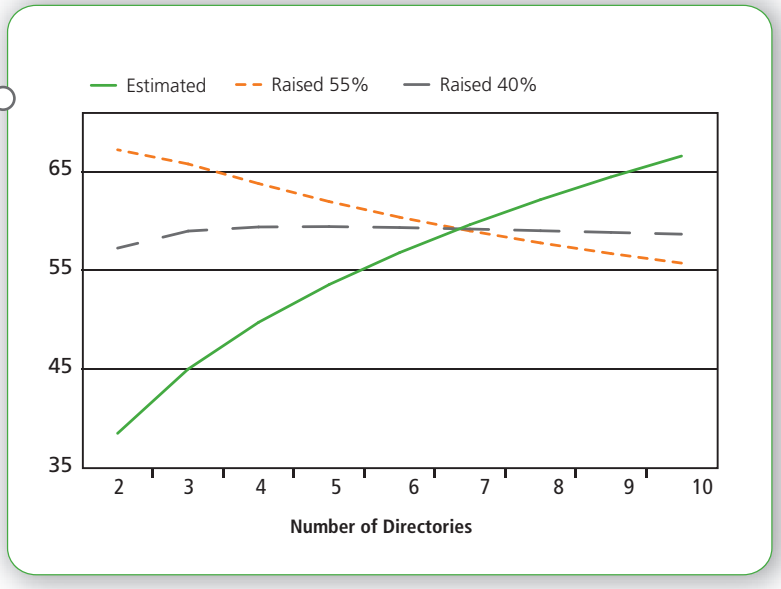
19 Werden & Froeb (2000), *supra* note 11.

to attract consumers. Hence, welfare rises although the network is broken up among two directories instead of one.

One insight from my paper that is particularly germane to the points being made here is the fragility of the results in the face of small parameter changes. Figure 1 presents total surplus calculated for different numbers of competitors for three parameterizations. The parameterizations differ in the treatment of the effect of usage on advertiser demand. The solid line represents the estimated parameter. The other two lines represent cases where this effect is 40 percent and 55 percent larger, respectively. What is interesting is what the result would have been if the network effect has been estimated to be larger. These experimental network parameters are larger than what was found but not unreasonably so, and probably could not be ruled out just on a priori common knowledge of the industry. For the estimated parameter, surplus increases as the number of firms increases. But strikingly, a 40 percent larger network parameter leads to a slightly humped shaped total surplus curve and a 55 percent larger parameter leads to a downward slope. Why downward sloping? A typical merger simulation could find surplus decreasing in the number of competitors because there are economies to have production concentrated at a single firm. That is not the case here as the simulation assumes that marginal cost is constant across quantities and publishers, and there are no fixed costs at all. Instead, the reduction in surplus is coming entirely from the increased number of competitors breaking up the network of consumers and advertisers and thereby reducing the benefits of network effects.

Figure 1

Surplus for different network parameters



The lesson for the use of simulations in antitrust is that the strength of the feedback between two sides of a market are crucially important in determining the outcome of the study. If one is to use guesswork rather than estimation to determine these parameters, one must consider a range of reasonable parameters to test the sensitivity of results. The fragility of these results would seem to support the use of estimation based on representative data rather than even well-informed guesswork. But one should not be unrealistic about what estimation approaches can deliver. Estimation procedures are driven by their own assumptions that can also be subject to sensitivity analysis. Furthermore, confidence intervals may play an important role. For instance, my 2004 paper uses statistical tests to reject the possibility that welfare decreases in the number of competitors but cannot reject the possibility of a hump shape. The paper concludes that the data argue in favor of moderate levels of competition but are silent on further increases.

II. Price Regressions

A direct test of market power is to show that prices increase in markets with less competition. A popular approach in the antitrust literature is to regress a market price on the number of competitors in a market and control for other market characteristics through observable variables. Like market simulations, price regressions play an important role in the determination of which cases the government pursues. In addition, price regressions have actually been introduced as evidence in court and seemed to play an important role in the results. In the discussion in Dalkir and Warren-Boulton's 2004 paper about the Office Depot-Staples merger,[20] the regression is essentially:

$$\text{Price} = f(N_{Competitors}, \textit{market variables})$$

The focus was on whether price dropped by more than five perecent in markets with an additional competitor.

Extending this sort of regression to a two-sided market brings up several issues. First, a two-sided market implies that there are at least two prices to check. One could imagine just looking at one price in isolation, but that may be misleading in the context of two-sided markets. Rather, a more useful approach will often be to specify two regressions, one predicting a price on each side of the market. Second, the number of competitors may differ across the two sides of the market. Therefore, the investigator must determine the relevant market in two markets rather than one. Furthermore, the market structures on both sides of the market determine each of the prices. Hence, there would be two measures of competition in each regression, necessarily complicating the analysis.

20 *See, e.g.,* the discussion in Dalkir & Warren-Boulton, *supra* note 5.

As an example, I discuss (very) preliminary work detailed in my 2007 paper (with Professor Ginger Jin), that studies sports card conventions, typically baseball cards.[21] Convention organizers must attract both collectors and dealers, which has implications for how they price. We observe prices on both sides of the market for around 50,000 conventions in the early 1990's. At the height of the market, there were up to 2,000 conventions a month in the United States so consumers and dealers often had a choice of conventions to attend, bringing conventions into competition with each other.

Crucial to the analysis is the determination of the number of conventions that compete for dealers and consumers. Based on discussions with industry sources, we argue that conventions on the same weekend that are within a particular distance compete for dealers but not consumers. A reasonable distance is one hundred miles. Consumers are unlikely to travel one hundred miles for a sports card convention whereas dealers would travel this distance. Conversely, conventions in the same town but on different days or adjacent weekends compete more strongly for consumers. Dealers will likely turn out for each of the conventions (multi-home) whereas consumers will go to only one, if only because the same dealers with the same collections will be at each. With these thoughts in mind, we specify the following regression system:

$$P_{Dealer} = f(N_{Dealer}, N_{Consumer}, \textit{market variables})$$

$$P_{Consumer} = g(N_{Dealer}, N_{Consumer}, \textit{market variables})$$

The goal of our 2007 paper is to test recent theories of two-sided markets, such as Rochet and Tirole present in their 2003 paper.[22] We expect N_{Dealer} to have a more negative effect than $N_{Consumer}$ on P_{Dealer}, and vice versa. In fact, we present a theoretical model in which $N_{Consumer}$ has a positive effect on P_{Dealer} (and vice versa). Certainly, it would be hard to justify such a result without appealing to explanations based on two-sided markets. The larger point is that we have gone from focusing on one parameter in the Office Depot-Staples merger case to four parameters in our 2007 paper.

This example may oversimplify many of the issues that would arise in typical antitrust examples. First of all, it may be difficult to characterize markets with a single price and finding methods for representing price schedules can raise complications.[23] Second, sports card conventions are attractive for research purposes not only because of their simple pricing but also because the vast number of them lends the industry to statistical analysis. Standard examples of two-sided markets,

21 Jin & Rysman, *supra* note 6.

22 J.-C. Rochet & J. Tirole, *Platform Competition in Two-Sided Markets*, 1 J. Eur. Econ. Ass'n 990 (2003).

23 For an attempt at this, see M. Busse & M. Rysman, *Competition and Price Discrimination in Yellow Pages Advertising*, RAND J. Econ 378 (2005).

such as website portals or videogame console manufacturers, likely generate more ambiguous prices and much, much fewer prices that may be proprietary secrets. While these problems are true even in the case of single-sided markets, they are magnified in the case of two-sided markets where we require data on two sides.

III. Other Questions

The previous two sections focused on tools that already have a role in antitrust analysis. However, two-sided markets bring up a number of questions that have not arisen previously, for which empirical analysis can be relevant. This section is very open-ended but I focus on two questions that seem particularly important. The first is the basic question of whether or not a market is two-sided. The second is whether market participants single-home or multi-home. I discuss both cases in the context of the analysis of the payment card industry in my forthcoming paper.[24]

One can easily imagine an antitrust case turning on the question of whether or not a market is two-sided. For example, the interchange fee set by Visa and MasterCard has been heavily litigated, and one of the principal defenses has been that the interchange fee is crucial in achieving the optimal level of transactions on both sides of the payment card market.[25] Testing for two-sidedness requires detailed data on both sides of the market, which is often a daunting task. Also, it would often be unclear what to test for as there is no widely agreed on definition of two-sidedness and some definitions are quite broad.

In my forthcoming paper, I address these issues in payment card industry. In order to test for two-sidedness, I test for a positive feedback loop between consumer usage and merchant acceptance, which can be thought of as an indirect network effect. There is some confusion as to the relationship between the two-sidedness of a market and whether a market exhibits an indirect network effect. An indirect network effect exists when consumers value a product based on how much of some complementary product is provided, and the amount of the complementary product depends on consumer purchases of the first good. This positive feedback loop between consumer purchases and the provision of complementary products has a similar flavor to the idea of getting both sides on board associated with two-sided markets. However, Rochet and Tirole, in their forthcoming paper, suggest a definition of two-sidedness that is somewhat broader

24 Rysman (forthcoming 2007), *supra* note 9.

25 In fact, the decision in favor of the interchange fee in the *NaBanco* case seemed to be based more on joint venture issues rather than two-sided arguments. We can logically separate whether a single, collectively set interchange fee is necessary for a payment card association to exist, in which case it might be legal under the standard treatment of joint ventures, from whether such an interchange fee is necessary to optimally provide a two-sided service, which would break new legal ground. NaBanco v. Visa, 779 F.2d 592 (1986).

than network effects.[26] In my paper, I rely on the fact that the presence of indirect network effects implies two-sidedness under all definitions of two-sidedness. While it is arguable whether the lack of indirect network effects implies a lack of two-sidedness, the presence of indirect network effects is surely sufficient.

It is obvious that there must be at least some network effect because consumers would not hold a card if no merchant accepted it. However, one may wonder if network effects are still detectable in a mature market with firms as large as Visa and American Express.[27] To establish two-sidedness, I rely on data from the *Payment Systems Panel Study* (from Visa International) that records consumer usage from 1998 to 2001. For one month out of each quarter, consumers record how they make every monetary transaction for the month. I observe whether the consumer uses cash or a payment card (or many other options) and the brand of the payment card. In addition, a separate data set, the Visa Transactions Database, records the dollar value of transactions on the Visa network for all merchants. I have these data monthly from 1998 to 2001. Because some charges for the other networks (MasterCard, American Express, and Discover) appear on the Visa network, I have proxies for network acceptance by month for each major network. Both data sets indicate the zip code, either of the household or the merchant, which allows me to establish regional correlations.

I use the panel survey to establish the favorite network of each household (the networks are Visa, MasterCard, American Express, and Discover). I then estimate a multinomial logit model of how consumers make this choice, which includes household demographics as explanatory variables and in particular, counts of how many merchants transact on each network in the household's 3-digit zip code. I interpret the counts as (noisy) measures of the extent of merchant acceptance. The results show a strong correlation between my measure of merchant acceptance and consumer usage of the payment network for Visa, American Express, and Discover. Interestingly, high merchant acceptance of Visa is not correlated with less consumer usage of MasterCard, and vice versa. This result is not surprising given that true merchant acceptance is practically identical for MasterCard and Visa and suggests that my proxies for merchant acceptance capture their intended effects well.

Even with the very detailed data, the study has some important limitations. In particular, it is difficult to establish causality. That is, I do not take a stand on whether the correlation between consumer usage and merchant acceptance is

26 Rochet & Tirole (2006), *supra* note 1.

27 For instance, Michael Katz writes: "There is an argument made by some analysts that implies that 'mature' payment networks might reasonably be treated as one-sided platforms at the margin." (M. Katz, What Do We Know about Interchange Fees and What Does It Mean for Public Policy?, Remarks at Interchange Fees in Credit and Debit Card Industries, Federal Reserve Bank of Kansas, May 5, 2005) *in* Proceedings - Payments System Res. Conf., May 2005, at 121.

caused by consumer usage affecting merchant acceptance or merchant acceptance affecting consumer usage or both.[28] However, it is sufficient to imply that the market is two-sided in any of these cases.

Given that a market is two-sided, one may then ask whether agents practice multi-homing or single-homing. That is, do buyers or sellers participate in multiple platforms or just one. The answer has important implications for market power. If one side of a market practices single-homing, then the only way for the other side to reach those agents is through their preferred platform. That is, a platform has substantial market power over access to subscribers that single-home, but much less so if they multi-home. Theoretical models such as Armstrong's predict intense competition between platforms on the single-homing side of the market and almost non-existent competition on the multi-homing side.

If one side of a market practices single-homing, then the only way for the other side to reach those agents is through their preferred platform. That is, a platform has substantial market power over access to subscribers that single-home, but much less so if they multi-home.

Finally in this paper, I characterize the level of single-homing in the payment card market. In particular, I use the panel survey to establish the extent to which consumers hold cards from different networks and the extent that they use cards from different networks. I find that the question of whether consumers multi-home has a more complex answer than commonly envisioned. With regards to usage, few consumers regularly use multiple networks. Most consumers put a great majority of their payment card purchases on a single network. The level of concentration varies only slightly with the choice of network or with consumer characteristics such as income, education, and spending. However, with regards to ownership, most consumers do maintain cards from different networks, which would allow them to take advantage of different networks quickly if they chose to do so. These results suggest that consumers prefer single-homing but are willing to use a less-preferred payment network to purchase a product for which there is no sufficiently close substitute. A merchant in a highly competitive environment most likely must associate with multiple payment networks or risk a real decrease in sales.

28 In fact, it is possible that there is some omitted heterogeneity that drives the correlation between usage and acceptance, although I try to rule that out by focusing on how merchant acceptance and usage at one network are correlated relative to the correlation at another network, rather than some absolute level of correlation.

IV. Conclusion

The paper provides an overview of recent empirical research in the economics of two-sided markets from the perspective of antitrust enforcement. Whereas the empirical tools developed in the study of industrial organization have found an increasingly important role in antitrust litigation, the much more recent empirical research on two-sided markets have yet to make an impact. However, this is likely to change in the near future. The two main empirical tools in antitrust, market simulations and price regressions, have natural corollaries for two-sided markets. Adopting these tools to two-sided markets brings up several problems. In particular, there is extra work in correctly calibrating or estimating how outcomes on one side of the market affect the other side of the market, and the requirement to learn about both sides of the market brings up associated data constraints. However, just as in one-sided markets, empirical tools can provide valuable information to antitrust enforcers in two-sided markets. ◀