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Exclusionary Vertical Restraints and Antitrust: Experimental Law and Economics Contributions*

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Abstract

Vertical restraints, such as vertical integration, exclusive dealing contracts, and tying and bundling practices, have been subject of lively policy and academic discussions. Scholars associated with the Chicago School challenged early foreclosure doctrines by arguing that vertical restraints primarily reflected efficiency considerations. More recently, industrial organization economists have used the tools of game theory and information economics to show that these business practices might actually serve anticompetitive purposes. The complexity of the theoretical frameworks and the scarcity of empirical evidence have limited the influence of these new economic theories on antitrust law and policies.

We argue that experimental law and economics might strengthen the contributions of economic theories of vertical restrains to the design and implementation of antitrust institutions. First, experimental law and economics provides empirical evidence of the

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robustness of economic theories of antitrust. Second, the combination of economic theory and experimental work represents the application of scientific research methods. As a result, the likelihood of admissibility in court of economic expert testimony might be strengthened. Third, experimental law and economics studies of antitrust involve the replication of complex and abstract economic theories using simple environments. These settings might facilitate policy-makers' understanding of economic theories of antitrust.

We start our analysis by characterizing the legal environment in which vertical restraints operate. We then outline the main components of the methods of experimental economics applied to the study of law, and discuss the contributions of experimental law and economics. Finally, we assess the validity of our claims regarding the contributions of experimental law and economics by investigating the methodological characteristics of seminal experimental work on vertical restraints and the outcomes produced by these studies. Although the experimental literature on exclusionary vertical restraints is relatively recent, our analysis of this work provides support to our claims.

KEYWORDS: Vertical Restraints; Experimental Law and Economics; Antitrust Law; Antitrust Economics; Vertical Integration; Exclusive Dealing Contracts; Bundling; Tying; Communication; Intentionality; Fairness; Reciprocity; Discrimination; Endogenous Payoffs; Bargaining Games; Coordination Games; Equilibrium Selection; Stackelberg Equilibrium; Cournot Equilibrium; Bertrand Competition; Fringe Competition; Scientific Research Methods; Economic Expert Testimony

JEL Categories: K21, K41, C72, C90, L12, L40, C72, C91, D62, D86, K12, K21, K41, L42

1 INTRODUCTION

Vertical restraints refer to arrangements between firms at different levels of the vertical chain that restrict the conditions under which these firms may operate. They often serve legitimate and value-enhancing business goals. On the other hand, vertical restraints may be anticompetitive.[1] These business practices have been the subject of lively policy and academic discussions. Scholars associated with the Chicago School (Director and Levi 1956; Posner 1976; Bork 1978) challenged early foreclosure doctrines[2] by arguing that vertical restraints primarily reflected efficiency considerations. More recently, industrial organization economists (Aghion and Bolton 1987; Rasmusen et al. 1991; Ordover, Salop, and Saloner 1990; Hart and Tirole 1990; Whinston 1990; Bolton and Whinston 1991, 1993; Spier and Whinston 1995; Segal and Whinston 2000; Nalebuff 2004) have used the tools of game theory and information economics to show that these practices might actually serve anticompetitive purposes.[3]

Legal scholars recognize the important role of economic theory in the design of non-arbitrary and effective antitrust policies. Without economic theories, antitrust institutions might be

[1] As Whinston (2006) notes, the economics of antitrust broadly encompasses two main important categories: Exclusion and collusion. Exclusion refers to the firm's attempt to preserve its market power through the exclusion of rival firms using exclusionary practices. These practices involve market foreclosure through vertical integration, exclusive dealing contracts, and tying and bundling, among other practices. Collusion refers to the firm's attempt to raise prices through collaboration with rival firms. Examples of these practices are price fixing and horizontal merger. Extensive experimental literature on collusion has been developed. (See surveys by Davis and Holt 2008; Normann 2008; Engel 2007; Holt 1995). The focus of this chapter is on the more recent experimental literature on exclusionary practices.

[2] Early foreclosure doctrines suggest that incumbent firms can use contracts to exclude potential entrants and hence, reduce competition.

[3] Bolton and Whinston (1991) state that the early foreclosure doctrines were not based on solid theoretical foundations. Hence, the Chicago School critics of the foreclosure arguments deserve credit for "pointing out [their] logical flaws"' (p. 207).

vulnerable to the instabilities generated by interest groups. As a result, the likelihood of achieving welfare-enhancing goals with those policies might be uncertain (Hovenkamp 2011). However, the influence of the new economic theories on antitrust policies has been limited.[4] This might reflect the scarce empirical evidence of the robustness of these theories (Lafontaine and Slade 2008).[5] In the field, contractual agreements between firms and negotiation processes are typically conducted in private. Then, the factors that affect these processes and outcomes are not easily observed by policy-makers. Importantly, the low impact of economic theories on antitrust institutions might be due to the complexity of the economic models. Hovenkamp (2011, p. 82) argues that

> Antitrust writers who are untrained in economics rely heavily on noneconomic values because this enables them to have an antitrust policy without undertaking the (sometimes difficult) task of learning how the market system works. That approach may be easier in the short run, but it is calculated to have painful consequences in the long run.

We argue that experimental law and economics might strengthen the contributions of economic theories of vertical restrains to the design and implementation of antitrust law and policies. First,

[4] Baker (2013) argues that, "Exclusionary conduct is commonly relegated to the periphery in contemporary antitrust discourse, while price-fixing, market division and other forms of collusion are placed at the core of competition policy… Exclusion is routinely described as having a lesser priority than collusion *it even though exclusion is well established as a serious competitive problem in both antitrust law and industrial organization economics*" (pp. 1-3; emphasis added).

[5] Lafontaine and Slade (2008) state that "Empirical evidence [regarding vertical restraints] is somewhat fragmented… Given the small number of available studies, it is difficult to make definite claims about robust empirical regularities … In particular, some of the studies yield … ambiguous effects from restraints" (pp. 13, 14, 21). They conclude "Further empirical work might reveal more systematically the sets of circumstances under which particular restraints tend to be undesirable" (p. 23). See also Lafontaine and Slade (2012, 2007).

experimental law and economics serves to test economic theories of antitrust. Hence, it provides empirical evidence of the robustness of these theories. Second, the combination of economic theories of antitrust and experimental law and economics represents the application of scientific research methods. As a result, the likelihood of admissibility in court of economic expert testimony based on economic theories of antitrust might be strengthened. Third, experimental law and economics studies of antitrust are characterized by the construction of simple numerical implementations of more complex and abstract economic theories. These simple environments might facilitate policy-makers' understanding of economic theories of antitrust and their implications.

We start our analysis by characterizing the legal environment in which vertical restraints operate. We then outline the main components of the methods of experimental economics applied to the study of law, and discuss the contributions of experimental law and economics.

Finally, we assess the validity of our claims regarding the contributions of experimental law and economics by investigating the methodological characteristics of seminal experimental work on vertical restraints and the outcomes produced by these studies. Although the experimental literature on exclusionary vertical restraints is relatively recent, our analysis of this work supports our claims: (1) These studies identify relevant modeled and previously non-modeled factors, such as fairness considerations, and provide empirical evidence of the anticompetitive effects of these business practices; (2) the combination of theoretical and experimental work implemented in these studies follows scientific research methods and hence, might increase the likelihood of court admissibility of evidence originated on economic models of vertical

restraints; and, (3) the simple environments implemented in these experimental studies certainly facilitate practitioners' understanding of the more complex economic models of vertical restraints

Although this chapter is motivated by vertical restraint environments, the analysis presented here applies to other environments as well. Consider, for instance, the design of mechanisms to facilitate judicial resolution of business deadlocks. Game theoretic models have been constructed to assess the equity and efficiency properties of different partnership dissolution mechanisms such as Shotguns and Auctions (see for instance Landeo and Spier 2013; Brooks et al. 2010; de Frutos and Kittsteiner 2008).[6] Experimental work on these mechanisms has facilitated practitioners' understanding of these theoretical models and their effects by providing simple numerical examinations of these theories (see Landeo and Spier forthcoming (a), forthcoming (b), 2013; Kittsteiner, Ockenfels, and Trhal 2012).[7]

The chapter is organized as follows. Section 2 discusses the current antitrust policies regarding vertical restraints. Section 3 describes the main components of experimental economics methods applied to the study of law, and discusses the applications of experimental law and economics to the study of vertical restraints. Section 4 is devoted to the analysis of seminal experimental law and economics studies on vertical restraints. Section 5 discusses the contributions of experimental law and economics work on vertical restraints, and concludes the chapter.

[6] In the Shotgun mechanism, one owner proposes a price, and the other owner decides whether to buy the other party's assets or to sell her assets to the other party at that price.

[7] See also JTA LE ROUX PTY LTD AS TRUSTEE FOR THE FLR FAMILY TRUST-V-LAWSON [2013] WASC 293 for an illustration of the impact of economic theories of business deadlock resolution (Brooks, Landeo, and Spier 2010, Landeo and Spier forthcoming (a)) on Australian judicial deadlock resolution institutions (Supreme Court of Western Australia, Justice Edelman).

2 ANTITRUST LAW AND VERTICAL RESTRAINTS

The Sherman and Clayton Antitrust Acts, and the Federal Trade Commission Act encompass the main U.S. federal antitrust provisions. The Sherman Act, passed in 1890, represents the first attempt to promote healthy competition. Sections 1 and 2 of the Sherman Act contain the main provisions regarding vertical restraints. Specifically, section 1 establishes prohibition on any "contract, combination … or conspiracy in restraint of trade." Section 2 condemns "monopolization." Commentators argue that the Sherman Act makes illegal certain acts of monopolizing, not monopoly itself. The passage of the Clayton Act in 1914 reflects an attempt to clarify the business practices that might be considered illegal. Section 3 of the Clayton Act forbids contracts imposing restraints in which customers "shall not use or deal in the goods, supplies, or other commodities of the lessor or seller," where the effect "may be substantially to lessen competition or tend to create a monopoly." This section regulates tying, bundling, and exclusive dealing.[8] Section 7 of the Clayton Act has been used to challenge vertical mergers.

Antitrust laws are enforced by the Federal Trade Commission and the Department of Justice Antitrust Division. The Federal Trade Commission Act, passed in 1914, created the Federal Trade Commission. Section 5 of the Act represents the fundamental enforcement provision. Commentators argue that this section applies not only to the violations included in the Sherman and Clayton Acts, but also to lesser acts that might violate the "spirit of those laws" (Hovenkamp 2011). The Department of Justice Antitrust Division shares jurisdiction over civil antitrust cases

[8] Bundling refers to the practice of selling two products together. Tying is a form of bundling. It refers to the practice of conditioning the sale of one product (the tied product) on the buyer's agreement to purchase a second product (the tying product). Exclusive dealing contracts refer to arrangements that state that one party to the contract will deal only with the other party for some set of transactions.

with the Federal Trade Commission. However, the Antitrust Division also has the power to file criminal cases against violations of the antitrust laws.[9]

The vagueness of the Sherman and Clayton Acts explains the important role of courts in interpreting their provisions.[10] Courts evaluate vertical integration and exclusive dealing contracts using a case by case rule of reason. Under this rule, economic efficiencies are balanced against possible anti-competitive harm (*Continental T.V., Inc. v. GTE Sylvania, Inc.*).[11] The current antitrust policies regarding vertical integration are reflected in *Port Dock & Stone Corp. v. Oldcastle Northeast, Inc.*:[12] "[A] complaint pleading that a defendant expanded vertically and as a result, decided to discontinue doing business with its erstwhile trading partners at the next level down, does not plead an actionable refusal to deal. Such allegations are equally consistent with the idea that the monopolist expected to perform the second level service more efficiently than the old trading partners and thus undertook the vertical integration for a valid business reason, rather than for an anticompetitive one."

The legal standard in cases of exclusive dealing contracts follows *Tampa*'s suggested rule of reason approach (*Tampa Elect. Co. v. Nashville Coal Co.*).[13] Under this rule, foreclosure on the order of thirty to forty percent of market share is generally necessary to avoid judgment for the defendant. This standard has been especially relevant for cases decided after *Jefferson Parish*

[9] The Hart-Scott Rodino Antitrust Improvements Act, passed in 1976, represents an amendment to the Clayton Act. It requires pre-merger notification to the Department of Justice and to the Federal Trade Commission in case of large mergers.
[10] For instance, even though promotion of healthy competition has become the center of the antitrust policy, the economic meaning of healthy competition is not well-defined in the antitrust law (Whinston 2006).
[11] 433 US 36, 97 S.Ct. 2549, 53 L. Ed. 2d 568 - Supreme Court, 1977.
[12] 507 F3d 117, 125, 2d Cir., 2007.
[13] 365 U.S. 320, 81 S.Ct. 623, 1961; on remand, 214 F.Supp. 647, M.D.Tenn., 1963.

Hosp. Dist. No. 2 v. Hyde.[14] When the foreclosed market share is sufficiently high, *Tampa*'s rule of reason requires courts to examine additional factors, such as contract duration, likelihood of collusion in the industry and the degree to which other firms in the market also use exclusive dealing practices, nature of the distribution system and distribution alternatives remaining available after exclusive dealing, and other pro- and anti-competitive factors.

Tying practices, on the other hand, are assessed using a modified *per se* rule approach. Courts have developed tests for assessing whether tying arrangements are *per se* unlawful. Evidence of coercion, sufficient economic power in the tying market, and anticompetitive effects in the tied market are the main factors considered in these tests. For instance, in *Yentsch v. Texaco, Inc.*,[15] the court applied a five-part test (Hovenkamp 2011, p. 435): 1) There must be separate tying and tied products; 2) there must be "evidence of actual coercion by the seller that in fact forced the buyer to accept the tied product;" 3) the seller must possess "sufficient economic power in the tying product market to coerce purchaser acceptance of the tied product;" 4) there must be "anticompetitive effects in the tied market;" and, 5) there must be "involvement of a 'not substantial' amount of interstate commerce in the tied product market." An exception to the application of the modified *per se* rule in cases of tying practices is represented by the D.C. Circuit in *United States v. Microsoft Corp.* case.[16] The court concluded that the bundling of software applications into a software computer operating system qualified for a rule of reason

[14] 466 U.S. 2, 44, 104 S.Ct.; Note 22, 466 U.S. at 45, 97 S.Ct. at 1575, O'Connor, J., concurring: "Exclusive dealing is an unreasonable restraint on trade only when a significant fraction of buyers or sellers are frozen out of a market by the exclusive deal." The concurrers concluded that thirty percent coverage was inadequate because they could not find evidence of anticompetitive effects (Hovenkamp 2011).
[15] 630 F2d. 46, 56-57, 2d Cir., 1980.
[16] 253 F.3d 34. 90, D.C.Cir.; cert, denied, 534 U.S. 952, 122 S.Ct. 350, 2001.

treatment. They stated that "applying *per se* analysis [...] creates risks of error and of deterring welfare-enhancing innovation" (Hovenkamp 2011, pp. 89-90).

An adequate application of the case by case and *per se* rules by courts requires good knowledge of the factors that affect the anticompetitive effects of vertical restraints. Economic models certainly contribute to the understanding of the effects of vertical restraint institutions. As we discuss in the next section, experimental law and economics might strengthen the influence of economics models of vertical restraints on the design and implementation of antitrust law and policies.

3 EXPERIMENTAL LAW AND ECONOMICS AND ANTITRUST

Experimental law and economics refers to the application of experimental economics methods to the study of legal institutions and business practices relevant to the design of legal institutions.[17] As Falk and Heckman (2009) argue, "[c]ausal knowledge requires controlled variation" (p. 537). Controlled laboratory experiments provide an optimal "methodology for advancing causal knowledge" (p. 535). The combination of experimental economics methods and economic modeling represents the application of scientific research methods.

[17] See Smith (1976), Plott (1982), Roth (1986, 1995), and Davis and Holt (1993) for seminal discussions about experimental economics methods. See Croson (2005), Croson and Gächter (2010) for more recent excellent discussions of experimental economics methods. See Roth (2008) for a discussion of the contributions of experimental economics methods to market design. See Hoffman and Spitzer (1985), McAdams (2000), Croson (2002, 2009), Talley and Camerer (2007), and Arlen and Talley (2008) for surveys regarding the application of experimental economics methods to law and economics.

Types of Studies

Three basic types of experimental law and economics studies might be applied to the analysis of antitrust institutions:[18] (1) Experimental studies that test economic theories of antitrust; (2) experimental work that assesses the effectiveness of specific antitrust policies before these policies are implemented in the field (testbed policy experiments);[19] and, (3) experiments that test economic anomalies (for instance cognitive biases) that might impede the effectiveness of antitrust policies.[20]

Experimental law and economics work on vertical restraints involves studies conducted to test theoretical models of antitrust.[21] The main features that these studies should encompass are as follows. First, the experimental settings must capture the theoretical assumptions.[22] However, the environments should be simple enough to ensure subjects' understanding of the environments and tasks. Second, economic theories involve choices and economic consequences of these choices. The relationship between subjects' payoffs and choices in the experimental settings (i.e.,

[18] This classification follows Roth (1986) and Croson (2002). Roth (1986) presents a general classification of experimental economics studies. Croson (2002) applies Roth's (1986) classification to experimental law and economics studies.

[19] For instance, in their seminal work on testbed policy experiments, Hong and Plott (1982) experimentally assess the effects of a policy change proposed by the Interstate Commerce Commission. (See Plott, 1994, for a general discussion of testbed experiments.) The experimental design used in these types of studies involves a degree of context and draws from subject pools that are aligned with the environments in which the policies will be implemented. The information provided by these studies might help to improve the design of antitrust institutions.

[20] "[A]n economic anomaly is a result inconsistent with the present economics paradigm [...] An empirical result is anomalous if it is difficult to 'rationalize,' or if implausible assumptions are necessary to explain it within the paradigm" (Thaler 1987, p. 198). In these types of studies, the degree of context and subject pools should be aligned with the real-life settings that trigger these anomalies. See for instance, Babcock et al. (1995) study on self-serving bias and pretrial bargaining, and Landeo (2009) study of cognitive biases and tort reform. See Thaler (1992) for more general applications of these types of experiments.

[21] Although the other two types of experimental work have not been used to study anticompetitive vertical restraints, their contributions might be significant.

[22] This implies an experimental environment with a high degree of internal validity.

the pay-for-performance schemes) should be aligned with the incentives encompassed in the theoretical models.[23]

Third, economic theories consist of abstract representations applicable to different situations and individuals. Although, the experimental settings should involve minimal context, the degree of context and labels should guarantee subjects' understanding of the experimental environment, tasks, choices, and consequences of these choices.[24] In addition, no specific requirements are imposed on the subject pools. Experiments in economics generally involve undergraduate students.[25] Fourth, experiments in economics do not use deception. As Croson (2005) states, this requirement is aligned with the theoretical assumption that agents understand and believe the relationship between their actions and their payoffs.[26]

[23] As noted by Smith (1976, p. 275), the experimental design should ensure control over the "[subjective] values [associated with the possible choices] [...] Such control can be achieved by using a reward structure to induce prescribed monetary value on actions." This concept is referred to as "induced valuation." A common criticism of experimental economics methods is related to the size of subjects' payments, and the degree of parallelism with the economic consequences of choices in the field. As noted by Falk and Heckman (2009, p. 537), "The effects of varying stake size are mixed and seem to depend on concrete experimental contexts." The implementation of additional experimental treatments that allow for different payoff levels might be recommended to test the robustness of findings related to certain research questions. See also Camerer and Hogarth (1999).

[24] The lab implementation of a theoretical setting generally involves the use of a simple context, i.e., a simple environment where the theory applies. For instance, the experimental environment might resemble a simple market setting. Labels such as player A and player B might be used to describe the roles played by the subjects. The use of minimal context ensures control over subjective interpretations of labels, and allows for replicability of the study by other researchers.

[25] Findings from experimental studies devoted to analyze the effects of subject pools suggest that the behavior of undergraduate students and other populations, in context-free experimental environments, are not significantly different (Fréchette forthcoming).

[26] This element represents a fundamental difference between experiments in psychology and economics.

Experimental Law and Economics Contributions

We argue that experimental law and economics studies of vertical restraints might strengthen the influence of economic theory on the design and implementation of antitrust policies. First, experimental law and economics studies might advance the knowledge of the factors that affect the anticompetitive effects of these business practices. Specifically, experimental studies conducted to test the theoretical predictions of economic models of antitrust might provide evidence of the robustness of these theories. If the economic theories do not work in these carefully controlled experimental settings (which replicate the theoretical assumptions and strategic environments), there is little hope that these theories would work in more complex field environments (Plott 1999). These studies might also reveal previously non-modeled factors that influence the impact of vertical restraints, and hence provide useful feedback to theorists.

Second, experimental law and economics might increase the likelihood of admissibility in court of the evidence provided by economic experts.[27] Under the *Frye* standard (*Frye v. United States*),[28] the admissibility of expert evidence was based on whether or not the particular opinion of a testifying expert was generally accepted. Kobayashi (1997) argues that "[i]n practical terms, this often meant that the theory has been published in a peer reviewed journal, a standard that game theory easily passes" (p. 414). However, in 1993, the Supreme Court rejected the *Frye* test (*Daubert v. Merrell Dow Pharmaceuticals, Inc.*).[29] A reliability standard under Rule 702 of the Federal Rules of Evidence was then established. This new test requires that the evidence (i) be

[27] See Kirkwood (1988).
[28] 293 F. 1013, 1923.
[29] 509 U.S. 579, 1993.

"scientific knowledge" (i.e., generated through scientific methods), and (ii) "will assist the trier of fact to understand or determine a fact in issue."

Economic testimony based solely on theoretical models (without empirical or experimental evidence) might fail the scientific method requirement of the *Daubert* test. In fact, this test has been previously applied to exclude or limit expert economic testimony (see for instance, *Ohio v. Louis Trauth Dairy, Inc*., 925 F.Supp. 1247, 1996). Hence, the combination of experimental work with economic modeling might strengthen the contributions of economic theory to the formulation of antitrust law and policies.

Finally, we claim that experimental law and economics might facilitate policy-makers' understanding of economic theories of antitrust. Regarding courts' knowledge of economic models of antitrust, Langenfeld and Alexander (2011, p. 25) indicate that "experts need to educate the court about standard economic methodologies. For example, in *Concord Boat*, the court stated that it did not find references to the Cournot economic model in previous cases. Virtually all economists or lawyers versed in antitrust are at least aware that the Cournot model is well recognized." This is, of course, an extreme example of the divorce between policy making and academic work on antitrust. However, the complexity of the new economic theories of antitrust might preclude policy-makers from understanding these frameworks. We argue that experimental law and economics represents an effective tool to educate policy-makers on economic theories of antitrust. Experimental economics studies involve replications of theoretical environments using simple numerical examinations. Hence, these settings might

facilitate practitioners' understanding of the contributions of complex mathematical models of antitrust.

4 EXPERIMENTAL STUDIES ON EXCLUSIONARY VERTICAL RESTRAINTS

This section assesses the validity of our claims regarding the contributions of experimental law and economics by examining seminal experimental work on exclusionary vertical restraints.

4.1 Vertical Integration and Market Foreclosure

Vertical integration involves situations in which vertically-related activities that could be located in separate businesses are combined and integrated "under one roof" in a single business.[30] Perfectly legitimate purposes might explain vertical integration. Vertical integration might allow firms to exploit technological complementarities, reduce transaction costs (Coase 1937), gain control over production processes and preclude opportunistic behavior, overcome informational imperfections, and internalize externalities.[31] Profit-maximizing goals will determine the firm's decision regarding "making" (vertically integration) or "buying." Vertical integration might also

[30] A wide range of vertical arrangements are alternatives to vertical integration. In these environments, legally enforceable contracts limit the behavior of the parties. These arrangements are termed *vertical restraints*. By giving one party some control over the other party's actions, these arrangements are a form of partial vertical integration. These practices include exclusive dealing contracts, and tying and bundling, among others, and are discussed next.

[31] Consider, for instance, the case of "double marginalization" (Tirole 1988). Double marginalization refers to a situation in which two independent firms (upstream and downstream), with market power in their respectively markets, apply markups in their prices (i.e., set prices above their marginal costs). Pricing above the marginal cost generates a deadweight loss. Due to the application of markups by both firms, deadweight losses occur twice. See also Riordan (2008).

serve anticompetitive purposes. It might be used by a firm as a tool to create or maintain market power.

The leverage theory of foreclosure states that vertical integration might be used by firms to extend their market power to other markets. As a result, vertical integration might harm downstream firms by precluding access to inputs. Similarly, this business practice might negatively affect upstream firms by removing supply opportunities. The insights from this theory have been applied in important antitrust cases. For instance, in *Brown Shoe Company vs. United States*,[32] Brown (a manufacturer of shoes) wanted to integrate with a shoe retailer. The Supreme Court concluded that the merger reduced competition by precluding access by competitors to the share of the market served by the acquired retailer. As a result, this merger was held illegal. The Chicago School (Bork 1978; Posner 1976) criticized this Court ruling by stating that market power in one market could not profitably be extended into other markets. Specifically, Bork (1978) argued that it would not be profitable for Brown to exclude rivals in the downstream market because the benefits from this exclusion to Brown would be offset by the losses to the shoe retailer.[33]

More recently, economists have used game theoretic models to show that vertical integration might serve to protect rather than extend market power, and lead to market foreclosure (Ordover,

[32] 370 U.S. 294, 1962.

[33] Forcing the shoe retailer to exclusively sell Brown's product (i.e., to stop doing business with upstream firms that offer less costly products) would generate losses in profits to the shoe retailer. Brown, on the other hand, would obtain gains related to increased sales in the downstream market. Bork (1978) argues that the retailer's losses would exceed the upstream firm's benefits. As a result, it would not be in the interest of the vertically integrated firm to foreclose upstream rivals.

Salop, and Saloner 1990; Hart and Tirole 1990; Bolton and Whinston 1991, 1993).[34] In these settings, a monopolist in an upstream market, faced with competition in the downstream market, may not be fully able to exploit its monopoly power because it may not be able to credibly commit to downstream firms that it will restrict output. Anticipating this situation, downstream firms will not accept contracts that allow the producer to fully extract monopoly profits.[35] Vertical integration resolves the monopolist's commitment problem,[36] and hence, enables the upstream monopolist to fully exploit its market power.[37]

Experimental Evidence

Martin, Normann, and Snyder (2001) experimentally assess the anticompetitive effects of vertical integration.[38] Their experimental environment replicates Rey and Tirole's (2001) theoretical model of vertical integration involving an upstream monopoly producer of an essential input, and two downstream firms that compete in the final good market. In their simple experimental setting, a manufacturer (the monopolist) and one or two retailers (the downstream

[34] See also Riordan and Salop (1995) and Riordan (1998). See Rey and Tirole (2001) for more recent work.

[35] The insights derived from these theories can be illustrated with a simple example. Consider an upstream monopolist and two downstream firms, firms A and B. The monopolist cannot credibly commit not to serve firm A's rival (firm B). This is because, after contracting with firm A, the monopolist will benefit from serving firm B as well. Anticipating the increase in competition and the lower profits, firm A will be willing to pay less to the monopolist. As a result, the upstream firm will not be able to make full monopoly profits.

[36] Consider vertical integration between the upstream firm and downstream firm A. The integrated firm will internalize firm A's losses associated with more competition. Then, the integrated firm will have an incentive not to serve downstream firm B.

[37] An important assumption in Hart and Tirole (1990) is that contracts are both bilateral and private.

[38] See Mason and Phillips (2000) for an interesting experimental study regarding the effects of vertical integration on collusion.

firms) play a bargaining game: The manufacturer proposes a contract and the retailers decide whether to accept or reject the contract.

The following experimental treatments are implemented. First, the integration treatments include integration and no-integration settings. The no-integration environment encompasses a single upstream firm that produces an input at constant average and marginal costs and two downstream firms that convert each unit of input into a unit of a homogeneous final good. The upstream monopolist can simultaneously make take-it-or-leave-it contract offers to each of the downstream firms specifying the quantity and fixed payment demanded. In the next stage, downstream firms simultaneously decide whether to accept or reject the offers. The integration environment involves an integrated firm (upstream and downstream units) and a nonintegrated downstream firm. Theory predicts that the integrated firm will commit to sell the monopoly quantity through its downstream subsidiary and not supply the other downstream firm. Hence, market foreclosure against the nonintegrated downstream firm will occur in equilibrium.

Second, the contract type treatments involve public and private contracts. In case of public contracts, the contract offers become publicly known before downstream firms make a decision. Public contracts might serve as a commitment device (the upstream monopolist can earn the monopoly profit by publicly offering half the monopoly output at half the monopoly profit to each downstream firm). If, however, the contracts are negotiated privately (downstream firms do not observe the contract offered to other downstream firms), theory predicts that the upstream monopolist will not be able to earn the monopoly profit without vertical integration.[39]

[39] Under secret contracts, there are multiple perfect Bayesian equilibria. The theoretical predictions depend on the out-of-equilibrium beliefs of downstream firms concerning the contract offered to their

Third, the interaction treatments include one-shot and finite repetitions. The authors claim that finite repetitions might act as a commitment device for the monopolist, and hence, generate market foreclosure even in the case of private contracts.[40] The interaction treatments are implemented using random and fixed grouping, respectively.[41]

Martin, Normann, and Snyder's (2001) findings suggest that vertical integration might induce market foreclosure. These results also indicate the presence of a monopolist's commitment problem, and that vertical integration and public contracts might serve as commitment devices. In fact, the total output and profit are similar and close to the monopoly level in the integrated and non-integrated/public contract environments.

Interestingly, their experimental results differ from the theoretical predictions regarding the division of profits between upstream and downstream firms. Theoretically, it is expected that the upstream firm will have all the bargaining power (by making take-it-leave-it offers), and hence, will get all of the industry profits. However, their findings under the two nonintegrated settings, with public and private contracts, suggest that the upstream monopolist obtains only a fraction of the industry profits. These results are aligned with the presence of nonmonetary preferences

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rivals. Under passive beliefs (i.e., when receiving an out-of-equilibrium offer, each downstream firm believes that its rival receives the equilibrium offer), output is higher, and the upstream monopolist's profits are lower than in the joint-profit-maximizing outcome. Under symmetric beliefs (i.e., when receiving an out-of-equilibrium offer, each downstream firm believes that its rival received the same out-of-equilibrium offer), output is set at the monopoly level and the joint-profit-maximizing outcome is achieved.

[40] If the game is played repeatedly, the upstream firm might be able to form a reputation for low output (i.e., to convince downstream firm A that it will not serve downstream firm B). Downstream firm A will then accept higher prices. As a result, the upstream monopolist will have an incentive to restrict its output, and hence, credibly commit to output restriction.

[41] All treatments involve 10 rounds. In the random grouping treatments, groups of three people are randomly chosen every round; in the fixed grouping treatments, grouping is decided at the beginning of the first round and stays fixed throughout all rounds.

observed in previous experimental work on ultimatum environments.[42] In these settings, the strategic anticipation of the receiver's rejection of inequitable offers (due to nonmonetary preferences) induces the proposer to make more generous offers (Hoffman et al. 1994). These findings are also consistent with recent work on more general bargaining environments, where nonmonetary preferences might induce more equitable allocations of the pie (Landeo and Spier 2014a). The unpredicted bargaining effects observed by Martin, Normann, and Snyder (2001) provide an additional rationale for the choice of vertical integration by monopolists.

Their experimental design also allows them to indirectly investigate the nature of out-of-equilibrium beliefs under private offers by assessing the downstream acceptance decision as a function of the contract offer. Their findings suggest that the beliefs of non-integrated downstream firms are heterogeneous (between passive and symmetric beliefs). This finding leads to the development of an empirically relevant extension to the theory. Finally, Martin, Normann, and Snyder's (2001) results do not provide support for reputational effects elicited by finitely-repeated interactions.[43] Extensions of this work might involve the implementation of the reputation conditions under infinitely-repeated interactions.[44]

[42] Ultimatum games involve two players, a proposer and a receiver. The proposer makes an offer to the receiver (i.e., he proposes an allocation of 10 dollars between the two players). After observing the offer, the receiver decides whether to accept or reject it. In case of rejection, each player receives zero dollars. Under standard preferences, the theory predicts that the proposer will offer zero dollars plus a penny to the receiver and the receiver will accept the offer. See Güth, Schmittberger, and Schwartz (1996) for seminal work on ultimatum games.

[43] In theory, finite repetitions allow the formation of reputation, and hence, solve the monopolist's commitment problem (see footnote 41). It is then expected that the findings from the one-shot and finite-repetition treatments will be different. Martin, Normann and Snyder's (2001) results do not suggest significant differences between these two treatments.

[44] The authors argue that Selten and Stoecker's (1988) findings on prisoners' dilemma settings suggest that infinitely-repeated interactions do not have a strong impact on subjects' behavior (compared to finitely-repeated interactions). However, recent studies indicate that infinitely-repeated interactions actually have significant effects (Dal Bó 2005). See also Landeo and Spier (2014b).

Normann (2011) experimentally investigates whether reputational considerations and the vertical integration institution might act as informal commitment devices for the upstream firm, and hence, induce market foreclosure. His experimental setting replicates Ordover, Salop, and Saloner's (1990) theoretical environment. This theoretical framework involves four players, two upstream firms and two downstream firms. The sequence of moves is as follows: the upstream firms decide whether to vertically integrate, the upstream firms simultaneously set input prices, and the downstream firms simultaneously set good prices (after observing input costs). Vertical integration would be profitable for the upstream firm if it could commit not to compete in the upstream market. This strategy would induce higher input prices, and hence, raise downstream rivals' cost.[45] Given that this strategic setting does not involve formal commitment (in the form of incentives), market foreclosure should not be observed in equilibrium.[46]

His experimental design focuses on the behavior of the upstream firms. Hence, it abstracts from the downstream market. The following treatments are implemented. The vertical integration treatments encompass vertically integrated and non-vertically integrated environments. In both environments, two upstream firms simultaneously decide the upstream price. In the integration treatment, the payoffs for the players include an additional component related to the downstream unit. Following Martin, Normann, and Snyder (2001), the reputational treatments involve one-

[45] If the integrated firm withdraws from the upstream market (i.e., the integrated firm stops serving downstream firms), competition in the upstream market would be reduced. As a result, downstream rival firms would face higher input prices.

[46] Ordover, Salop, and Saloner (1990) present this argument. Hart and Tirole (1990) and Reiffen (1992) demonstrate that, even though foreclosure would be a profitable strategy for the integrated firm in Ordover, Salop, and Saloner's (1990) environment, it is not an optimal strategy. The integrated firm still has an incentive to compete in the input market. Given that Ordover, Salop, and Saloner's (1990) setting does not endogenously elicit commitment, their claims hold only by imposing the assumption that commitment is present. Hart and Tirole (1990) argue, however, that this assumption is strong: "Commitment is unlikely to be believable" in these environments. Normann (2011) provides a refined analysis of Ordover, Salop, and Saloner's (1990) theoretical environment.

shot and finite repetition environments. In theory, it is expected that neither the vertical integration institution nor the presence of finitely-repeated interactions will solve the commitment problem of the upstream firm. In fact, a Bertrand equilibrium in which each firm charges the minimum price should hold.

Normann's (2011) findings suggest that prices are significantly higher in markets where vertical integration is allowed (compared to non-integrated settings), i.e., the integrated firm's pricing behavior is less competitive than that of a nonintegrated firm. However, integrated firms do not completely foreclose the input market (i.e., firms do not completely refrain from competing in the input market). These results hold in both the one-shot and finitely-repeated environments. The lack of evidence for market foreclosure indicates that the commitment problem of the upstream firm (pointed out by Hart and Tirole 1990, and Reiffen 1992) cannot be resolved by implementing informal commitment devices such as a vertical integration institution without formal commitment or reputational considerations elicited through finite interactions.[47] These findings are aligned with previous experimental studies on commitment (Huck and Müller 2000; Reynolds 2000; Cason and Sharma 2001; Martin, Normann, and Snyder 2001).[48]

[47] See Martin, Normann, and Snyder (2001) regarding the elicitation of reputational considerations through finite interactions.

[48] Although the findings are not aligned with the equilibrium predictions, they are consistent with a quantal-response equilibrium analysis of the game (McKelvey and Palfrey 1995), a behavioral game-theory concept. Quantal response equilibrium takes decision errors into account, so that players do not choose the best response with probability one but choose better choices more frequently. In the context of this study, quantal-response equilibrium implies that integrated firms do indeed price less competitive than nonintegrated ones. Integrated firms still compete in the input market (that is, there is no market foreclosure).

4.2 Anticompetitive Effects of Exclusive Dealing Contracts

Exclusive dealing contracts encompass arrangements that state that one party to the contract will deal only with the other party for some set of transactions and include transfers of money from one party to the other in exchange for exclusivity. The literature on exclusive dealing contracts underscores the use of such contracts as a market foreclosure mechanism.

Beginning in the 1950s, scholars identified with the Chicago School argued that exclusive dealing contracts could not be profitably employed by incumbents to exclude more efficient rivals (Director and Levi 1956; Posner 1976; Bork 1978).[49] Hence, exclusive dealing arrangements would be adopted only when they served legitimate business purposes, such as preventing free riding and protecting relationship-specific investment.[50] Recently, scholars have used the tools of game theory and information economics to show that exclusive contracts may be adopted for purely anticompetitive reasons. In fact, rational firms would, in some circumstances, use such contracts to exclude rivals and reduce competition.

Rasmusen, Ramseyer and Wiley (1991) and Segal and Whinston (2000) demonstrate that an incumbent monopolist can use exclusive contracts (modeled as transfers from the incumbent to a buyer in exchange for the buyer's promise not to buy from any other seller) to deter efficient

[49] Although the incumbent seller would want to discourage the entry of competitors in order to protect market share and profits, buyers would prefer to facilitate entry (since entry would lead to lower prices). Given the amount of money that the monopolist would need to pay to convince the buyers to agree on exclusive deals (their increased consumer surplus from entry), this strategy would be unprofitable for the monopolist.

[50] See Kaplow (1985) for a comprehensive discussion of this literature.

entry when there are economies of scale in production.[51] Entry becomes unprofitable when sufficiently many buyers accept the contracts.[52] When the incumbent seller cannot discriminate and must make the same offer to all buyers, there is multiplicity of equilibria: both exclusion and entry might occur in equilibrium. When the incumbent monopolist can discriminate and make better offers to some buyers than to others, Segal and Whinston (2000) demonstrate that the unique equilibrium involves exclusion.

Important antitrust cases involve exclusive dealing practices. For instance, in *In re Beer Distribution Antitrust Litigation*,[53] Anheuser-Bush was accused of requiring distributors to exclusively distribute Anheuser-Bush products. More recently, Microsoft was accused of requiring computer manufacturers, internet service providers, and software producers to exclude, at least partially, Netscape's Navigator Web browser in favor of its own Internet Explorer browser.[54]

[51] The theoretical environment involves three main stages: The contracting stage (where the monopolist makes offers to both buyers, and after observing both offers, the buyers simultaneously decide whether to accept their respective offers); the entry stage (where the potential entrant decides whether to enter the market), and the pricing stage (where market prices are determined).
[52] Kaplow (1985) critiqued the Chicago School using a similar logic.
[53] 188 F.R.D. 557, 1999.
[54] 253 F.3d 34, 2001. Additional cases involving exclusive contracts include United States v. Visa U.S.A, 344 F.3d 229 (2003), in which Visa was attacked for its agreements with banks that prohibited them from distributing rival credit cards, including American Express and Discover; United States v. Dentsply (399 F.3d 181 (2001)), in which Dentsply, the dominant maker of artificial teeth, was accused of illegally excluding rival manufacturers through exclusive agreements with dental wholesalers; and Conwood v. United States Tobacco (290 F.3d 768 (2002)), in which United States Tobacco, the dominant producer of moist snuff, was accused of illegally excluding rivals using exclusive contracts with retailers. See Kwoka and White (2009).

Experimental Evidence

Landeo and Spier (2009) experimentally study the factors that affect the anticompetitive effects of exclusive dealing contracts. They replicate Rasmusen, Ramseyer, and Whiley's (1991) and Segal and Whinston's (2000) strategic environments in a laboratory setting.[55] Their simple experimental environment involves a two-stage game with three players (an incumbent monopolist and two downstream buyers). The exclusive dealing setting consists of transfers from the monopolist to the buyers in exchange for exclusivity. Specifically, in the first stage, the incumbent monopolist offers a transfer to each buyer. In the second stage, each buyer decides whether to accept or reject the offer. When the monopolist cannot discriminate and is constrained to propose equal offers to both buyers, the strategic environment resembles a coordination game with endogenous payoffs, in which equilibrium with exclusion, and equilibrium with entry might occur.[56] When the incumbent monopolist can discriminate and make a better offer to one of the buyers, the strategic environment involves a unique equilibrium with exclusion. Divide-and-

[55] Landeo and Spier (2009) focus their experimental design on Rasmusen, Ramseyer and Wiley's (1991) and Segal and Whinston's (2000) contracting stage. This design strategy is aligned with the purpose of the study (to assess the factors that influence the determinants of exclusion) with the goal of minimizing subjects' cognitive effort.

[56] Specifically, the strategic setting resembles a stag-hunt game (also called "an assurance game"). Strategic uncertainty arises in this environment: although both buyers are better off by coordinating on rejection (which allows the potential entrant to enter the market, to compete with the monopolist, and to bring the prices down to the monopolist's marginal cost), each buyer will reject the contract only if he is sufficiently sure the other buyer will also reject the contract. See Ochs (1995) for a survey of seminal experimental work on coordination games. See Harsanyi and Selten (1988) for a theoretical discussion of equilibrium selection mechanisms in coordination games.

conquer strategies allow the incumbent seller to exploit the negative externalities between the buyers and foreclose the market.[57]

They first study the effects of discriminatory strategies (strategies under which the incumbent monopolist makes different offers to the two buyers in an attempt to induce market foreclosure). Two offer treatments are implemented, no discrimination (where the incumbent is constrained to make equal offers) and discrimination (where the incumbent's offers can be different). Second, building on previous findings from experimental economics and social psychology regarding fairness (Loewenstein, Thompson, and Bazerman 1989),[58] reciprocity (Sobel 2005), and the role of intentionality on triggering social preferences (Blount 1995), Landeo and Spier (2009) explore the effect of payoff endogeneity (operationalized through the comparison between contracts designed by other human subjects versus contracts exogenously provided) on exclusion. Two buyer-payoff treatments are implemented, endogenous and exogenous. Under the endogenous conditions, a human seller chooses the offers. The seller gets a payoff equal to zero in case of rejection by both buyers. Under the exogenous-payoffs conditions, a computer exogenously makes the offers.[59] Subjects are informed that the computer makes the offers.

Third, they assess the effects of non-binding communication between buyers (Aumann 1990; Farrell and Rabin 1996; Duffy and Feltovich 2002; Cooper et al. 1992; Crawford 1998; Blume

[57] In this setting, entry occurs if both buyers reject the contract. Hence, the acceptance of the contract by one buyer negatively affects the likelihood of entry and the payoff of the other buyer. In the literature, this is referred to as a negative externality between the buyers.
[58] See Fehr and Schmidt (1999) and Bolton and Ockenfels (2000, 1998) for theoretical studies of social preferences.
[59] Each exogenous session is matched with a previously run endogenous session, and the computer is programmed to follow the pattern of offers made by the human seller in the corresponding endogenous session.

and Ortmann 2007). Two communication treatments are implemented, no-communication and two-way buyer-buyer communication (where the buyers state their intentions before deciding whether to accept or reject the exclusive deals). The theoretical predictions suggest that divide and conquer strategies will increase the likelihood of market foreclosure. In theory, neither communication nor intentionality will affect the exclusion rate.

Landeo and Spier's (2009) findings indicate that exclusion may be surprisingly easy for incumbent firms to achieve. Even in the absence of discrimination, when adequate communication channels were not available, subjects failed to coordinate on their preferred equilibria and entry was deterred. Second, coordination was particularly elusive when the incumbent seller had a human identity. The human face of a sales representative (an agent for the seller) might elicit fairness and reciprocity from the agents representing the buyers, and facilitate the exclusion of faceless rivals (in the event of contracts perceived as fair). These results underscore the importance of the seller's intentionality. Third, their experimental analysis suggests that, better communication among the buyers induces more generous offers from the seller and a higher likelihood of entry, when discrimination is not allowed. Hence, communication among non-competing buyers might serve the public interest by facilitating entry.

Fourth, as predicted by Segal and Whinston (2000), their results indicate that the ability of the incumbent to discriminate in the contract terms offered to the buyers enhances the effectiveness of exclusionary practices, when buyers are allowed to communicate.

Landeo and Spier (2012) assess the robustness of Landeo and Spier's (2009) findings regarding the effects of payoff endogeneity to the explicit presence of a potential entrant, and explore the effects of communication between the potential entrant and the buyers about the incumbent seller's offers and the likelihood of exclusion.[60] Their strategic environment involves a four-player, two-stage game. In addition to the roles of seller and buyers, their experimental environment includes the role of a potential entrant (a fourth passive player). The potential entrant is a captive player because her payoff depends on the decisions of the incumbent monopolist (the contract designer) and the two buyers. The explicit presence of a potential entrant might induce the buyers and the strategic seller to consider this fourth party, and hence it might affect the exclusionary power of exclusive dealing contracts. The entrant gets a payoff greater than zero only in case of rejection by both buyers. Thus, the explicit presence of an entrant might act as a focal point device, i.e., "a signal that coordinates [buyers' mutual] expectations" (Schelling 1960, p. 54).[61] Hence, it might induce buyers to choose their preferred equilibrium (the entry equilibrium).

Their experimental design encompasses two buyer-payoff treatments, endogenous payoffs (contract offers decided by a human seller) and exogenous payoffs (contract offers exogenously administered by the computer). They also consider two communication treatments; no-

[60] See Bohnet and Frey, (1999) and Andreoni and Rao (2011) for evidence of the effects of communication on enhancing social proximity. Although Landeo and Spier's (2012) experimental environment is characterized by anonymity, communication might still reduce social distance by allowing buyers to learn more about the potential entrants. Schelling (1968), as cited in Bohnet and Frey (1999, p. 339), states that "the more we know, the more we care." See also Hoffman et al. (1996) and Charness, Haruby, and Sonsino (2007).

[61] Schelling argues that "[coordination problems] provide some focal point for a concerted choice, some clue to coordination, some rationale for the convergence of the participants' mutual expectations" (Schelling 1960, p. 90). He also states that "[a] prime characteristic of … focal points is some kind of prominence or conspicuousness" (Schelling 1960, p. 57).

communication and one-way unstructured entrant-buyers communication (where the potential entrant sends unstructured messages to both buyers after the buyers receive the proposal from the seller but before the buyers make their decisions).

Landeo and Spier's (2012) results indicate that Landeo and Spier's (2009) findings regarding the effect of endogeneity are robust to the explicit presence of a potential entrant. In fact, endogeneity significantly increases the likelihood of exclusion. Buyers are more likely to accept exclusive contracts when they are endogenously designed by a human seller (rather than exogenously generated). Second, communication between the entrant and the buyers reduces the likelihood of exclusion, and induces more generous sellers' offers. Third, their findings suggest that the explicit presence of an entrant might act as a focal-point mechanism in exogenous-payoffs environments, facilitating buyers' coordination on their preferred equilibrium (entry equilibrium).

Smith (2011) and Boone, Müller, and Suetens (2012) provide additional experimental tests of Rasmusen, Ramseyer, and Wiley's (1995) and Segal and Whinston's (2000) environments. Smith's (2011) experimental design involves a multi-player three-stage game. Specifically, she studies the effects of the number of buyers, size of the minimum efficient scale (percentage of buyers required to exclude), and non-binding communication between buyers in a non-discriminatory offer setting (i.e., in settings in which the incumbent seller is restricted to make the same offers to all buyers). Smith's (2011) findings suggest that, while the number of buyers is not shown to significantly impact exclusion rates, a higher fraction of signed buyers necessary for exclusion significantly decreases the exclusion rate. These findings might suggest that

industries with larger fixed costs, smaller technological advantages of the potential entrant, and larger scale efficiencies would be more likely to elicit foreclosure effects due to exclusive dealing. Consistent with Landeo and Spier's (2009) findings, her results suggest that exclusion rates are lower when buyers engage in non-binding communication. Boone, Müller, and Suetens (2012) study the effects of sequential offers, private contracting, and discrimination, implementing Segal and Whinston's (2000) environment in the lab. They find that discrimination increases exclusion rates only when offers are both sequential and private. Contrary to the theoretical predictions, their results suggest that exclusion through sequential offers is a costly strategy. Buyers reject more frequently low offers, which induce sellers to be more generous in their offers.

4.3 The Leverage Theory of Tying and Bundling

Bundling refers to the practice of selling two products together. Pure bundling implies that the products are available only as a bundle. Under mixed bundling, the products are available on both a stand-alone basis and as a bundle. Furthermore, the price of the bundle is lower than the sum of the two individual prices. Tying is a form of mixed bundling. It refers to the practice of conditioning the sale of one product (the tied product) on the buyer's agreement to purchase a second product (the tying product).[62]

Tying and bundling practices can be used to ensure quality and improve overall performance of a product or a service. These practices might also serve to price discriminate (*Illinois Tool Works*

[62] For instance, if a printer is compatible with only the seller's ink cartridges, then the seller conditions the sale of the ink cartridges (the tied product) on the purchase of a printer (the typing product).

Inc. v. Independent Ink, Inc.),[63] and to raise prices for the combined package (*Eastman Kodak Co. v. Image Technical Services, Inc.*).[64] Importantly, tying and bundling might be used to raise rivals' costs, and create barriers to entry (*United Stated v. Microsoft).*[65]

Courts have condemned tying practices under the leverage theory, which states that a firm with monopoly power in one market can use its leverage to engage in tying to monopolize a second market. Chicago School scholars (Director and Levi 1956; Bowman 1957; Posner 1976; Bork 1978) challenged this view.[66] They claimed that leveraging could not increase the monopolist's profits. Hence, if a monopolist did employ tying, his motivation could not be to leverage his market power. Instead, the motivation could be related to efficiency or to price discrimination. Whinston (1990) demonstrates that the Chicago School's criticism of the leveraging theory holds only if the competition level in the tied market is not affected. By tying, Whinston argues, the monopolist can reduce sales of its tied-good market competitor, and hence, lower the competitor's profits below the level that would justify continued operation. Hence, tying can lead to monopolization of the tied-good market, and exclusion of the competitor.

More recently, Nalebuff (2004) analyzes the effects of bundling practices in an oligopolistic environment. He shows that bundling might also act as an effective entrant-deterrent mechanism. Specifically, a company that has market power in two goods can, by bundling them together, make it harder for a rival wishing to sell only one of these goods to enter the market. Bundling allows the incumbent to defend both products without having to price low in each market.

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[63] 547 U.S. 28, 2006.
[64] 504 U.S. 451, 112 S.Ct. 2072, 1992.
[65] 253 F.3d 34, 2001. An additional antitrust case involving tying and bundling is *LePage's Inc. v. 3M* (324 F.3d 141, 2003).
[66] See Kaplow (1985) for a criticism to the Chicago School position.

Nalebuff's (2004) analysis also demonstrates that bundling is an effective tool even if entry deterrence fails. Since bundling mitigates the impact of competition on the incumbent, an entrant can expect the bundling strategy to persist, even without any commitment. In contrast to Whinston's (1990) model in which tying commits the monopolist to being more aggressive against an entrant, and this commitment discourages entry, Nalebuff's (2004) find that bundling reduces the entrant's potential profits while mitigating the profit loss to an incumbent if entry occurs. Thus, bundling is credible even without any commitment device.[67]

Experimental Evidence

Hinloopen et al. (2014) examine the market foreclosure effects of product bundling by implementing a simple experimental environment in which a firm with monopoly power in one market faces competition by a second firm in another unrelated market. This experimental environment replicates the general features of the oligopoly model of bundling presented by Martin (1999).[68] Two bundle treatments are included, pure bundle and no-bundle environments.[69] Two sequence-of-moves treatments are also included; simultaneous moves (both firms simultaneously decide their output levels) and sequential moves (a leader makes a first move; after observing the output decision of the leader, the follower makes an output decision).

[67] Choi and Stefanadis (2001) also rely on a commitment to bundle as a way to deter entry. In their setting, bundling decreases the expected returns for the potential entrant, and therefore, may lead to foreclosure and reduction of the total welfare. See also Carlton and Waldman (2002). See Simpson and Wickelgren (2007a) for more recent work.

[68] Martin's (1999) findings suggest that bundling can allow a firm with a monopoly in one market to leverage the market power in other markets, to strategically disadvantage rivals in those markets, and to reduce social welfare. He shows that bundling by a firm with a monopoly over one product has a strategic effect because it changes the substitution relationships among the goods that consumers choose.

[69] Mixed bundling is not allowed in this environment.

The sequence-of-moves treatments are implemented to examine the commitment value of product bundling. Specifically, under simultaneous-move Cournot competition, the bundling firm trades off reduced sales in its monopoly market to increase output in the duopoly market. The bundling strategy might operate as a commitment device to sell more in the second market. Under a Stackelberg setting, when both markets have identical demand and cost structure, additional commitment is not required as the monopolist is the first mover. Hence, in theory, bundling should not affect optimal quantities. Previous experimental work on Stackelberg settings without bundling, however, suggests that non-monetary preferences such as inequity-aversion considerations (Huck, Müeller, and Normann 2001, 2002; Fonseca, Huck, and Normann 2005; Müller 2006) might preclude Stackelberg leaders from exercising their first-mover advantage. Hence, the sequence-of-moves treatments might support the claim that bundling provides additional commitment power to the Stackelberg leader.

Their findings suggest that bundling represents an effective mechanism for transferring market power from one market to another market. Bundling successfully works as a commitment device, across sequence-of-moves treatments. With simultaneous moves (bundling, no-bundling), the monopolist offers the number of units predicted by the theory. Interestingly, when the monopolist is the Stackelberg leader, the predicted equilibrium is better attained with bundling and average outputs are significantly closer to the theoretical predictions. These findings might indicate the presence of non-modeled behavioral factors. Under bundling, the followers might understand that any output reduction of the Stackelberg leader would generate larger costs. Hence, they might infer that the decisions of the leaders do not involve intentionality to hurt the

followers.[70] These results are aligned with Landeo and Spier's (2009, 2012) findings regarding the effects of sellers' intentionality on buyers' (receivers) acceptance, in the context of exclusive dealing contracts. Importantly bundling negatively affects consumer surplus and total surplus.

Caliskan et al. (2007) experimentally study whether bundling and the addition of fringe competition in an originally monopoly market affect market foreclosure and social welfare in strategic settings that allow for mixed bundling. Their experimental environments involve posted-offer markets with two sellers in the first market, a dominant seller and a second seller representing the fringe competition. The dominant seller also participates in the second market, where he faces three identical competitors. A computer preforms the role of buyer.[71] In theory, it is profitable for the multiproduct firm to offer a pure bundle, which results in a residual stand-alone demand in the second market too small to support independent sellers in that market. Bundling is an optimal price strategy even in the absence of a competitor in the first market. Hence, in theory, the multiproduct firm bundles, deters entry in the second market, and reduces consumer and total surplus.

The following experimental treatments are implemented. First, three fringe treatments are considered: fringe competition with eight percent of the dominant seller's capacity, fringe competition with five percent of the dominant seller's capacity, and no-fringe competition.

[70] Specifically, followers might infer that the output choice of the bundling firm simply reflects the leader's need to maximize profits in the first market. Hence, the intentions of the monopolist might be perceived as less hostile.

[71] Each session involves several five-second rounds. A posted-offer market is implemented every round as follows: computer-buyers arrive at the marketplace in random order, and a buyer searches for the best price offer (the one that maximizes her surplus). A purchase occurs only when the buyer's surplus from the best offer is non-negative, and the seller providing the offer has available capacity. If two or more sellers make the same best offer, the buyer randomly chooses one of them.

Second, two bundling treatments are studied: bundling (where pure and mixed bundling practices are allowed) and no-bundling.

Their findings regarding the effects of fringe competition with eight percent of the dominant seller's capacity suggest that a fringe seller in the first market increases the total consumer surplus realized from the first and second markets, and decreases the total seller surplus. However, the effects of fringe competition on total welfare (consumer and seller surpluses), relative to no-fringe competition, are not significant. In this environment, bundling does not induce exclusion, and does not affect consumer surplus or total welfare. Similarly, fringe competition does not change the exclusionary and welfare implications of bundling (even though this competition decreases the bundle transaction price). Their results under fringe competition with five percent of the dominant seller's capacity confirm the theoretical prediction regarding exclusion: bundling helps the dominant seller exclude his competitors in the second market, generating complete foreclosure in thirty percent of the cases. However, the effects of bundling on consumer surplus or total welfare are not significant. Contrary to the theoretical predictions, their findings suggest that monopolists also use mixed bundling (separate units of first-market products are sold in addition to the bundled products). In this environment, fringe competition increases the total consumer surplus in the first and second markets, decreases the total seller surplus (a weaker effect, compared to the effect of fringe competition with eight percent of the dominant seller's capacity), and increases total welfare. In addition, fringe competition does not affect the exclusionary and welfare effects of bundling (despite decreasing the bundle price).

A final experimental environment is implemented. It consists of fringe competition with five percent of the dominant seller's capacity and higher efficiency in producing first-market products (lower fixed cost of the dominant seller in the first market). Their findings suggest that the higher efficiency of the dominant firm in the first market induces a transfer of the consumer surplus that the fringe seller originally generated back to the dominant firm. Specifically, this higher efficiency in production for the dominant firm decreases the consumer surplus and increases the seller surplus. However, the effect on total welfare is not significant.

Although this study provides evidence of the effects of bundling on market foreclosure, Caliskan et al.'s (2007) findings do not suggest that the seller's ability to bundle harm consumers.

5 DISCUSSION AND CONCLUSIONS

This chapter argues that experimental law and economics might strengthen the contributions of economic theory to the design and implementation of antitrust law and policies. Although the experimental literature on exclusionary vertical restraints is relatively recent, our analysis of these studies supports our claims. Specifically, our analysis of experimental work on vertical restraints suggests that these studies: (1) generate empirical evidence of the anticompetitive effects of these business practices; (2) apply scientific research methods (i.e., combine theoretical and experimental tools) and hence, might increase the likelihood of admissibility in court of economic expert testimony; and, (3) provide simple numerical representations of

complex economic models, and hence, might enhance practitioners' understanding of relevant economic theories.

Consider first the case of vertical integration. Martin, Normann, and Snyder's (2001) and Norman's (2011) experimental environments represent simple replications of the more complex theoretical models developed by Rey and Tirole (2001) and Ordover, Salop, and Saloner (1990), respectively. Importantly, their experimental settings allow them to study the effects of modeled and previously non-modeled factors. Martin, Normann, and Snyder's (2001) findings provide conclusive evidence of the foreclosure effects of vertical integration. Interestingly, their findings suggest that publicly-observed vertical contracts might also induce market foreclosure by acting as a commitment device for the monopolist. Normann's (2011) study deepens our understanding of the role of extrinsic incentives associated with vertical integration on solving the upstream firmt's commitment problem, and hence, allowing him to foreclosure the market. Although these studies generally support the theoretical predictions, they also suggest the presence of previously non-modeled behavioral regularities, and hence, provide useful feedback for theorists. For instance, Martin, Normann, and Snyder's (2001) experimental results in the non-integrated settings differ from the theoretical predictions regarding the division of profits between upstream and downstream firms. More equitable allocations are observed in these environments, suggesting the presence of non-monetary preferences and/or the monopolist's strategic anticipation of others' non-monetary preferences. The strategic monopolist might anticipate other actors' non-monetary preferences, and hence, be even more inclined to vertically integrate.

Regarding exclusive contracts and market foreclosure, Landeo and Spier's (2009) environment represents a simple numerical implementation of Rasmusen, Ramseyer and Wiley's (1991) and Segal and Whinston's (2000) theoretical frameworks. This study provides strong evidence of the exclusionary power of exclusive dealing contracts. Their findings suggest that divide-and-conquer strategies from monopolists are effective foreclosure mechanisms. Importantly, their results also indicate that market foreclosure may be surprisingly easy for incumbent firms to achieve. Even in the absence of discrimination, when adequate communication channels are not available, buyers might fail to coordinate on their preferred outcome and entry might be deterred. These findings are robust to the presence of an actual potential entrant (Landeo and Spier 2012), and to an increase in the number of buyers (Smith 2011). Smith's (2011) findings also suggest that industries with larger fixed costs, smaller technological advantages of the potential entrant, and larger scale efficiencies might strengthen the exclusionary power of exclusive dealing contracts.

Although Landeo and Spier's (2009) results are aligned with the theoretical predictions, they also reveal the presence of previously non-modeled behavioral factors. For instance, their results indicate that coordination between buyers is particularly elusive when the incumbent seller proposes contract offers that are perceived as unfair. In fact, the human face of a sales representative (an agent for the incumbent monopolist) might elicit fairness and reciprocity from the agents representing the buyers, and facilitate the exclusion of faceless rivals. The presence of social preferences (i.e., buyers' fairness and reciprocity considerations) and the importance of the seller's intentionality might explain these findings.

Landeo and Spier's (2009) and Smith's (2011) findings also suggest that better communication among the buyers might lead to more generous offers from the seller and a greater likelihood of entry. Hence, communication among non-competing buyers might serve the public interest by facilitating entry. Finally, Landeo and Spier's (2012) results indicate that communication between the potential entrant and the buyers reduces the likelihood of exclusion. These results might be explained by the presence of social preferences (which are elicited by the increase in the social proximity between the buyers and the potential entrant) and/or the role of the explicit presence of an entrant as a focal-point coordination mechanism.

Regarding bundling practices, Hinloopen, Müller, and Normann's (2014) study nicely replicates Martin's (1999) theoretical framework using a simple experimental setting. Their results indicate that these business strategies represent an effective mechanism for transferring market power from one market to another market. Moreover, Caliskan et al.'s (2007) study suggests that these results are robust to the presence of fringe competition in the upstream market. A lower fringe competition's market share strengthens the anticompetitive effects of bundling. Although Hinloopen et al. (2014) findings suggest a negative effect on consumer welfare, Caliskan et al.'s (2007) results do not indicate that the seller's ability to bundle harm consumers. More experimental investigation is therefore necessary. Interestingly, Hinloopen et al.'s (2014) results suggest the importance of intentionality, a previously non-modeled factor, on the outcomes of market interactions in sequential settings.

The analysis presented in this chapter suggests that the combination of theoretical work and experimental analysis might enhance the policy implications of the economic theories of antitrust, and hence, the welfare effects of this theoretical work.

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