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**ABSTRACT:**

*After its publication in 1990, Michael Whinston's article on Tying, Foreclosure, and Exclusion quickly achieved fame for being the first formal mathematical demonstration that the practice of tying two separate products in a sale had the potential to foreclose competition and could therefore be used for such a purpose. The paper demonstrated that it was possible, under certain conditions, to use the monopoly power in one market to foreclose competitors in another market, as long as that other market had fixed costs to entry and was not perfectly competitive. Whinston's paper quickly became the reference paper for those who instinctively believed that the commercial tying of two products in different markets could have a harmful effect on consumers. Because this presumption was under heavy assault at the time when the article was published, its results and the arguments it laid out were greeted with particular enthusiasm by some and, in all cases, with a lot of interest.*

## I. Introduction

After its publication in 1990, Michael Whinston's article on *Tying, Foreclosure, and Exclusion*[1] quickly achieved fame for being the first formal mathematical demonstration that the practice of tying two separate products in a sale had the potential to foreclose competition and could therefore be used for such a purpose. The paper demonstrated that it was possible, under certain conditions, to use the monopoly power in one market to foreclose competitors in another market, as long as that other market had fixed costs to entry and was not perfectly competitive. Whinston's paper quickly became the reference paper for those who instinctively believed that the commercial tying of two products in different markets could have a harmful effect on con-

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sumers. Because this presumption was under heavy assault at the time when the article was published, its results and the arguments it laid out were greeted with particular enthusiasm by some and, in all cases, with a lot of interest.

## II. The *Per Se* Treatment of Tying Practices in Antitrust Law

The idea that tying was a coercive practice that hurt the proper functioning of markets had a long history and was particularly ingrained in the legal profession. Since 1922, the jurisprudence in the United States consistently interpreted the practice of tying two separate products as a *per se* violation of antitrust law, be it under the Sherman Act or the Clayton Act. Between 1922 and the mid-1970s, U.S. courts condemned under the *per se* rule the tying of shoemaking machines with auxiliary machines, tabulating cards with tabulating machines, salt with salt canning machines, the tying of movies in distribution, the tying of land lease and shipping services, and the tying of credit services and pre-fabricated homes.[2] The reversal in the latter case— establishing the illegality of making the credit services provided by U.S. Steel Corporation conditional on the purchase of pre-fabricated homes in 1977—marked the beginning of a hesitation relating to the harmfulness of tying. In this case the reversal was based on the fact that the company was not proven to have had an advantage in the tying market of credit provision.[3]

These series of judgments condemning the practice of tying were characterized by the presumption that tying the sale of one product to another could have no other purpose than to give an unfair advantage to the tying firm on the tied market. There was little weight put on the possible efficiencies of the practice, nor was there any analysis of the market conditions that might allow tying to cause harm to competitors. This series of judgments may or may not have been appropriate, but what is notable is that they relied on a strong presumption of foreclosure and actual harm and provided little evidence as to the mechanisms by which such foreclosure or harm would actually take place.

In Europe, tying has also traditionally been examined by the European Commission with a de facto *per se* approach. The practice of tying a product to another separate product supplied

[2] United Shoe Mach. Corp. v. United States, 258 U.S. 451, 459 (1922); IBM v. United States, 298 U.S. 131, 140 (1936); Int'l Salt Co. v. United States, 332 U.S. 392, 396 (1947); United States v. Paramount Pictures, Inc., 334 U.S. 131, 156 (1948); N. Pac. Ry. Co. v. United States, 356 U.S. 1, 3 (1958); Fortner Enters., Inc. v. U.S. Steel Corp., 394 U.S. 495, 50004 (1969).

[3] U.S. Steel Corp. v. Fortner Enters., Inc., 429 U.S. 610, 622 (1977).

by a dominant firm can be challenged under the Art. 102 of the Treaty on the Functioning of the European Union ("TFEU")—previously known as Art. 82 of the Treaty on the European Union. In the quite representative case *Hilti*, a nail gun producer was accused of foreclosing manufacturers of nails compatible with its machines by requiring that its patent-protected cartridges be supplied with *Hilti* nails.[4] The Commission established that *Hilti* was dominant in the market of nail guns and that there was a separate market for *Hilti* compatible nails where several suppliers had been active. These elements were sufficient to establish an abuse of dominant position under antitrust law. This case is representative of the European Commission's established approach where the combination of dominance in the tying market, and the demonstration of a separate market for the tied product, may be sufficient to establish an infringement.

## III. The Chicago Critique

The legal treatment of antitrust practices was, in the 1970s, already at odds with the Chicago school of thought ("Chicago School") that had been rapidly developing since the 1950s. The Chicago School was a radical application of neoclassical economics that emphasized the natural tendency of markets to reach efficient equilibria with optimal welfare results. This school of thought, inspired by the principles of general equilibrium theory, experienced a phenomenal increase in influence all the way to the late 1970s when its formal application started reaching its limits. The main body of this research describes how economic agents, following rational optimization exercises, reach equilibrium outcomes that are both efficient and optimal from a welfare point of view.

The practical application of the Chicago school of neoclassical economics to antitrust was epitomized in the book, *The Antitrust Paradox*, published in 1978 by Robert Bork. In this book Bork argued that the role of antitrust policy was to protect consumer welfare and not competitors, and that markets left to operate freely were more likely to achieve this goal. In particular, it noted that antitrust enforcement with the view of protecting the presence of competitors in a market might result in higher prices for consumers due to the protection of less efficient producers. In fact, according to Bork, antitrust enforcement should consist of little more than

[4] Eurofix vs. Hilti (1988) OJ L65/19.

fighting cartels, the harm of which remained undisputed.

This book exemplified two trends of thought that were gaining weight in the 1970s. One was that antitrust law had to rely on rigorous economic analysis. The other was that the best economic policy was one of laissez-faire as unilateral conducts of firms in a market where entry was possible were rarely inefficient. With his 1976 *Antitrust Law: An Economic Perspective,* Judge Richard Posner became another strong proponent of the use of economic analysis in the antitrust field, also proposing efficient motivations for commercial practices that had been previously assumed harmful. Needless to say, this movement practically advocated the *per se* legality of many previously suspicious behaviors, including tying.

The strongest critique of the *per se* condemnation of tying practices came in the form of the "single monopoly rule." Neoclassical economists argued that a monopolist does not have anything to gain from tying the sale of another product to the good over which it has a monopoly. If the tied good is a complementary good to be uniquely combined with the principal good, the producer can extract all monopoly rent by adequately pricing the primary good over which it has a monopoly. It can gain nothing by tying both products since the value of the bundle for the consumer does not change with the tie. This means that if it raises the price of the complementary good above its competitive price, it will have to decrease the price of its monopolized good in order not to lose demand for its good. The price of the bundle will be unaffected. In fact, the monopolist will have the incentive of keeping the secondary product as competitive as possible in order to increase the value of and the demand for its monopolized good.

In the case where both the tying market and the tied market are monopolized, consumers will still be better off with a single firm producing both goods since that firm will have a stronger incentive to lower the price of any of the goods as it will benefit from the increase in the demand of its other good. Tying was perceived as preventing the "double marginalization" effect. Finally, in the case of unrelated goods, there was even less of a case for tying since by linking its product to another that may or may not be valued by the monopolist's customers, the demand of the monopolized good might fall because the bundle becomes unattractive for some.[5]

Chicago neoclassical economists therefore argued that there were no profits to be made by using tying to increase market power. The logical implication was then that manifestations of commercial or technical tying could only be motivated by efficiency considerations.

[5] *See* K. Hylton & M. Salinger, *Tying Law and Policy: A Decision-Theoretic Approach*, (69) ANTITRUST L.J. 469 (2001).

## IV. Efficiency Defense of Tying Practices and the Weakening of the Legal *Per Se* Approach

Efficiency reasons for tying were formally developed over the years and generated a rich analysis of the circumstances under which firms can benefit from tying without having any anticompetitive intent. It was already acknowledged that tying was obviously efficient when it led to decreases in production or distribution costs that resulted from producing and selling the goods together. This efficiency was somewhat imperfectly incorporated in the *per se* analysis that considered that tying did not fall under scrutiny if the tied and tying products were considered to be part of the same market. Recent research in behavioral theories has also demonstrated that there can be demand side efficiencies from tying several products or services into a package, simplifying and reducing the cost of decision-making for the consumer.

A producer might also have an incentive to tie a complementary product to ensure the quality of the entire bundle. An investment in the quality of the main product can be lost on the user if the complementary product fails. There will be more incentives to invest in quality if the manufacturer is sure to appropriate the benefits of a higher valuation by ensuring the quality and proper functioning of the complementary components. A similar argument relates to the protection of the brand when the user is not able to tell the origin of a malfunction in the operation of a bundled product or service.

Tying can also be a way for a producer to impose price discrimination in the case of users with different degrees of usage intensity. The metering of usage can be achieved by tying a variable component that increases with usage to the main product. In this case, the demand for the two products is positively correlated, but different users will buy different amounts of the tied complementary good. One can think of printers and ink cartridges, or drink dispensers and cups. Tying the variable component to the main product allows the producer to charge intensive users more while keeping a lower price for those users that have less usage and assign less value to it.

Further arguments relating to pricing efficiency were developed for the context in which a producer has a monopoly in several markets. In that framework, it was shown that bundling together products that have a negatively correlated demand allows the producer to better approximate prices to the actual valuation of the entire bundle by the consumer. If we consider two products where consumers tend to have a very strong preference of either one over the other, then selling the products separately results in lower prices for each. This is because both prices will be lowered to capture some of the consumers with lesser valuations. If the two products are combined, the lower valuation for one product will be compensated by the higher valuation of the other product so that the price of the whole bundle need not go down so

much. In fact this argument has been extended to cover cases where the demand of products is actually unrelated, although in such cases tying is more susceptible to productive and allocation inefficiencies as the size of the bundle grows.[6]

Let us note that tying for the purpose of metering or price discrimination does not necessarily increase total consumer welfare. But all these efficiency-enhancing reasons for tying have in common the fact that they constitute behavior that is profitable for the firm without any need of a resulting foreclosure of competitors. Firms can therefore engage in tying without necessarily harming the competitive process.

The increased acceptance of these possible efficiency motivations for the practice of tying resulted in a more cautious approach by the U.S. courts with respect to the automatic application of the *per se* rule against tying. This was symptomatic of a gradual but general process of retreat of *per se* reasoning by U.S courts, which continues today.

The emblematic judgment on tying came in 1984 with the U.S. Supreme Court judgment in *Jefferson Parish Hospital*.[7] That case, which started in 1977, concerned the exclusive sourcing of anesthesiologists from a specialized firm by Jefferson Parish Hospital. This resulted in independent anesthesiologists not being able to supply the hospital with their services. The Supreme Court judgment established a modified *per se* rule requiring that, for tying to constitute an antitrust violation, consumer harm in the form of "forcing" the consumption of the tied good had to be demonstrated. It also required the demonstration of substantial negative effects on trade. In this case the Court ruled that the market for anesthesia services was not sufficiently affected.

This modified rule was not the *per se* legality argued by the Chicago neoclassicists but it made the *per se* approach conditional on: (i) defining separate product markets for the tying and tied products, (ii) the tying entity possessing some market power in the tying market which made it possible to cause consumer harm, and (iii) there being a substantial effect on the trade of the tied market.

Despite the more nuanced approach of the courts, the strongly advocated *per se* legality treatment of tying never came to see the light. Besides a natural resistance to condone a practice that had long been assumed to be harmful, by the 1980s economic thinking was already evolving away from the simplistic theoretical framework of neoclassical theory to a much rich-

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[6] *See* W. Adams & J. Yellen, *Commodity Bundling and the Burden of Monopoly*, 90 (3) Quarterly J. Econ. 475-498 (1976); McAfee, McMillan, & Whinston, *Multiproduct Monopoly, Commodity Bundling, and Correlation of Values*, 104 (2) Quarterly J. Econ. 371-383 (1989).

[7] Jefferson Parish Hospital District No. 2 v. Edwin G. Hyde, 466 U.S. 2 (1984).

er game theoretic approach.

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## V. The Evolution of Neoclassical Economics and the Rise of Oligopoly Theory

Neoclassical economics, the principles of which still form the main body of applied economics, developed as an extremely formalized branch of economics that put at the center of all analysis the determination of the equilibrium between supply and demand. In neoclassical economics the existence of equilibrium is always assumed and the path towards this equilibrium is of no importance. In the study of markets there is no analysis of the dynamics of the competitive process, but only an interest in determining a static equilibrium to which the market is assumed to naturally converge. The mechanism that determines the equilibrium is described by a set of "rational" decision-making rules adopted by firms and individuals, which are mathematically modeled as constrained maximization exercises.

Despite the success of neoclassical economics, its field of application was actually quite limited. Decades of research in general economic theory could not demonstrate whether the general equilibrium theory can be universally applied and, in fact, its applicability in markets of imperfect competition could not be established. Similarly, non-linearity and issues relating to non-price competition were difficult to assimilate in this framework. Consequently, most of the market analysis under neoclassical economics was limited to comparative statics between the equilibria derived from changing circumstances in either a monopoly or a perfect competition setting. The single monopoly rule is an example of such an exercise. It is a comparison of profit under the equilibria with the tying of two products and without the tying of such products in markets where there is a monopoly in the tying product and perfect competition in the potentially tied market.

By the early '80s, comparative statics could not address many of the relevant real world questions. This led to the increased popularity of a richer analytical framework based on game theory that was able to incorporate dynamic interaction between competitors. Game theory continued to be neoclassical in that it relied on rational decision-making rules of optimization. But there was room for a process of interaction and strategic behavior that led to a richer set of possible equilibria. Many more variables, such as investment in innovation or sunk costs, were the subject of strategic decision-making as opposed to being determined by some kind of "natural" state. The framework allowed for strategic behavior where actors took decisions today that were profit maximizing only by their effects in other peoples' future decisions. This resulted in a whole new literature on non-cooperative competition.

The publication and success of Whinston's article on *Tying, Foreclosure and Exclusion* can be understood in this setting. In his article, Whinston shed light on the limitations of the neoclassical analysis of tying. He demonstrated the limited scope of applicability of the single monopoly profit and showed that under a richer framework the conclusions of the Chicago School leaning towards a *per se* efficiency of tying did not hold.

## VI. Whinston's Seminal Article

In his seminal article, Whinston pointed to the limitations of the single monopoly profit approach. In particular, he contested the assumption that the price in the tied market is taken as given so that a tying monopolist is a price-taker in that market. In contrast, Whinston argued that tying two products had the potential of changing the price in the tied market as well, potentially also affecting the market structure in that market. The key to Whinston's argument is the possibility that the tied market is neither a perfectly competitive market nor a monopoly but rather an oligopoly. He defines the tied market as a market with fixed costs of entry and economies of scale.

The main premise of Whinston's reasoning is that by tying the sale of a product to another product in which he has a monopoly, a producer can reduce the demand of the tied product that is available to other producers. In this way, it can reduce the profitability of competitors by denying them the necessary economies of scale. In some cases tying can lead to foreclosure. But correlation of tastes across goods and consumers matters for the efficacy of this strategy, therefore Whinston analyzes the different scenarios under which this strategy is likely to be more effective.

Whinston also introduces the notion of pre-commitment to tied products, something akin to a technical tying for its irreversibility. He argues that when the tying and tied products have independent demand, and when consumers are all similar, tying without pre-commitment will make no difference. The Chicago School notion that a firm will not risk losing sales of its monopolized products because of the tying of a less valued product holds. The firm will therefore never tie if consumers do not value the tie enough, or always tie if they do, but then the implicit price of the tied good will be the same as the price absent the tie as predicted by the neoclassical economists. The market outcome is similar to the no tying situation.

If the firm can pre-commit to the tying by not making available just the tying product alone, then foreclosure can occur because, in order not to lose profitable sales of its monopolized product, the firm will have to lower the price of the tied product. The higher the margin on the monopolized product, the more it will have an incentive to lower the price of the tied

product. This can happen to the point that even a more efficient competitor in the tied market becomes unprofitable and has to exit. Tying is costly to the tying firm because it reduces the profit on the bundle compared to a situation of independent pricing. In this case, tying only makes sense if it leads to foreclosure. In fact, tying makes sense not only if foreclosure is achieved but also if there is no re-entry. If consumers attach low value to the tied product this strategy will not be effective even with foreclosure due to the overall decrease in the demand of the monopolist's principal product.

More interesting results are obtained when consumers are allowed to have diverse tastes for both the tied and tying product in a market. In this case, tying will cause a more aggressive pricing of the tied product if a sufficiently large number of consumers find the monopolized product attractive and have strong preferences for one or the other of the tied products. In this case alone attaching the tied product will decrease the profits of competitors in the tied market. Otherwise pre-commitment to tie can still be profitable, but will not necessarily lead to foreclosure as the price in the tied market may rise.

In fact tying can be profitable even without pre-commitment and in the presence of an ability to sell the monopolized product without a tie. This is a reflection of the pricing efficiency motivations detailed above. Whinston adds to this literature the possibility that this sort of bundling also has foreclosure effects through the reduction of available demand to competitors in the tied market and the denial of scale efficiencies.

When the tying and tied products are complementary, Whinston argues that the general result of the neoclassical theory mostly holds and the monopolist will have an interest in keeping the market for the complementary product as competitive as possible. He identifies, nonetheless, two exceptions to this rule. When the product in the potentially tied market has a secondary use that does not require purchasing the main product, the monopolist of the principal product can use tying to foreclose producers of the tied product who serve those customers that do not purchase the tying product. Also, when there is an inferior alternative to the monopolized product, tying the complementary component might eliminate the opportunity to supply the complementary product independently and therefore will also foreclose the suppliers of the alternative to the monopolized product. These two exceptions relate to situations in which increases in the demand of the complementary product do not necessarily increase the demand for the monopolist's product.

With his article, Whinston established that in oligopolistic markets there were both efficiency motivations and strategic motivations for tying and that the strategic foreclosure of competitors was possible under certain conditions. Whinston also established the importance of customer valuations in the implementation of such a strategy. He then made clear that the nature of the link between the two products to be potentially tied was an important element in the incentive to foreclose.

Since Whinston, the premise that the tying of two products can result in strategic foreclosure has never been questioned. Quite the contrary, a whole body of literature has developed to investigate further the strategic and efficiency motivations of tying with the purpose of establishing some guidance for a rule of reason approach.

## VII. Tying in Oligopolistic and Dynamic Competition

After Whinston established the potential exclusionary effect of tying, research built on a game theoretical approach to investigate the various possible motivations and consequences of tying. Most research focused on results for markets that were oligopolistic and where firms faced rivalry on several markets at a time. Also, several new elements of reality were incorporated with new dimensions of choice, such as the decision to enter new markets, the decision to invest in R&D, or the ability to differentiate.

Nalebuff (2004) demonstrated the possibility of the exclusionary motivation of tying identified in oligopolistic markets of complementary products where the tying firm is not a monopolist. He showed that tying can be used to protect market power in both markets by depriving competitors of the sufficient scale to enter profitably in any one of the tied markets. In this case the entry deterrence effect is obtained through an increase in the tying firm's pricing efficiency.[8]

Matutes & Regibeau (1992) showed that when firms compete on several complementary components of a system, they will offer discounts for users to buy all components from them, thereby creating an effective bundling. This strategy, unlike Nalebuff (2004), can be followed by competitors, which generates excessive competition compared to a situation where there is

[8] B. Nalebuff, *Bundling as an Entry Barrier*, 119 (1) QUARTERLY J. Econ. 159-187 (2004).

no bundling.[9]

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Carbajo et al. (1990) and Chen (1997) showed that tying by firms competing in several markets can lead to a softening of competition when the market of the tying product is oligopolistic. In this case, and unlike in the Whinston single monopolist framework where tying commits to more aggressive pricing, tying the goods is done in order to increase the degree of differentiation in the market, thereby reducing the incentives to price aggressively.[10]

Carlton & Waldman (2002) developed a model in which tying is a profitable strategy to protect a monopoly in the tying market when there is a threat of entry by the tied product producer into that market. In this case, the incentive to either foreclose or reduce scale in the tied market is to preempt competition in the monopolized market. This strategy is profitable when entry in a tied market affects the likelihood of entry in the tying market by generating economies of scope.[11]

Choi (2004) showed that tying complementary products can serve as a commitment strategy to invest in R&D. Tying can be used as a commitment to more aggressive R&D in the tied market since this will reduce costs in that market and increase demand in the tying market.[12] R&D might also increase in the tying market in order to secure the monopoly in both markets.

Farrell & Katz (2000) addressed the effects of tying on innovation in the case of complements where one of the goods is monopolized. The tying firm will invest more in innovation in the tied firm, forcing other independent suppliers to lower the price of the complementary product. This strategy does not necessarily lead to foreclosure but is still profitable for its effects

[9] C. Matutes & P. Regibeau, *Compatibility and Bundling of Complementary Goods in a Duopoly*, 40 (1) J. INDUS. ECON. 37-54 (March 1992).

[10] J. Carbajo, D. de Meza, & D.J. Seidmann, *A Strategic Motivation for Commodity Bundling*, 38 (3) J. INDUS. ECON 283-298 (1990); Y. Chen, EQUILIBRIUM PRODUCT BUNDLING, 70 (1) J. BUS. 85-103 (1997).

[11] D. Carlton & M. Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON 194-220 (2002)

[12] J. Choi, *Tying and innovation: A dynamic analysis of tying arrangements*, 114 (492) ECON. J. 83–101 (2003).

on the monopolist's demand. The behavior might nonetheless lead to R&D inefficiencies.[13]

Choi and & Stefanadis (2001) showed that tying can be used by a monopolist to defend itself from entry, both in its monopolized markets and in the market for complements, when entry in either market requires risky investment in innovation.[14] In these circumstances, tying will require that entry be successful in both markets simultaneously. The increased risk of failure may discourage the innovation investment and entry.

The extent of the literature reveals that introducing dynamic competition, barriers to entry, product differentiation, and rich consumer preferences produce a wide range of possible results. A decade after Whinston's article there was no overwhelming calls for a *per se* legal or *per se* illegal approach. Rather the economic profession, was more inclined to access tying with a rule of reason.

## VIII. Towards a Rule of Reason: An Attempt at Formalizing Decision Rules

The legal community was not completely unaffected by this more sophisticated economic approach to tying. The Microsoft case towards the turn of the century served as a sort of catalyst. In this case, comparative static analysis was clearly inappropriate given the rate of technological innovation and the obvious dynamic effects. In both the United States and the European Union, the Microsoft case helped establish in practice that tying could harm dynamic competition.

The European Commission's 2004 Microsoft decision of 2004 was the first time the European Commission attempted to demonstrate effects in a tying case.[15] Before this, the assessment of the harmfulness of tying relied on the existence of two products in distinct markets being combined by a firm dominant in one of the markets. The European Union had been immune to the revolution spurred by the Antitrust Paradox and had continued with a quasi '*per se*' *per se* approach, as exemplified in *Hilti* (1988) and even *Tetra Pak II* (1992). But in 2004, the European Commission found that Microsoft had abused its dominant position in the PC operating system market by tying Windows Media Player with Windows operating system.

[13] J. Farrell, & M.L. Katz, *Innovation, Rent Extraction, and Integration in Systems Markets*, 48 J. INDUS. ECON. 413-432 (2000).
[14] J. Choi & C. Stefanadis, *Tying, Investment and the Dynamic Leverage Theory*, 32 RAND J. ECON 52-71 (2001).
[15] Microsoft Commission decision of 24 March 2004, Case COMP/C-3/37.792.

The decision relied on finding that Microsoft was dominant, that there was a separate market for the tied product, that consumers were subject to the tie, and that the tying foreclosed competition. The Commission argued that the network effects available to the Windows Media Player, once it was tied to Windows, provided it with an unfair advantage. The Commission rejected Microsoft's efficiencies arguments.

The U.S. Microsoft case that started in 1998 related to the tying of the Explorer internet browser with Windows. The Court of Appeals found in 2001 that *Microsoft*'s bundling of its internet-browsing software to its operating-system software did not necessarily violate section 1 of the Sherman Act, and that a rule of reason had to apply to tying arrangements involving platform software products because of their novelty. The plaintiffs also had to demonstrate that the harm outweighed the benefits. The case settled in 2001.

Foreseeing a shift towards a rule of reason approach in the assessment of tying, the academic community provided several attempts at summarizing the lessons learned from the economic literature. The search was for a set of robust criteria that would weigh on the likelihood of harm in cases of tying. One such example is Nalebuff (2003), who identified factors that relate to different motivations for bundling. These factors relate to market power in one or several markets, complementarity of goods, consumer dispersion in valuations, low marginal costs, and the presence of network effects.[16] He also proposed a decision -making tree to evaluate the risk of anticompetitive tying in the context of mergers. This test requires establishing the incentives to tie, examining the static effects on consumers, examining the effects on competitors, and evaluating the likelihood of permanent exit.

In another example, Hylton and Salinger (2001) analyzed whether entry barriers, complementary goods, network effects, and technologically dynamic markets can be useful criteria for a *per se* diagnostic and found that they all have imperfect predictive power.[17] They argued for a very high threshold for plaintiffs to show consumer harm.

Evans et al. (2003) reasoned along the same lines and proposed that the cost efficient

[16] B. Nalebuff, Bundling, Tying, and Portfolio Effects, DTI Economics Paper No. 1(2003).

[17] K. Hylton & M. Salinger, *Tying Law and Policy: A Decision Theoretic Approach*, 69 ANTITRUST L.J. 469-521 (2001)

*The acknowledgment of the need for both more sophisticated analysis and the need to define assessment criteria for something more akin to a rule of reason culminated in modernization exercises by antitrust authorities in both Europe and the United States.*

policy is to adopt *per se* legality.[18] They assumed that tying is more likely to be efficient and that the likelihood of a false acquittal is low. On the other hand, the likelihood of false convictions in a *per se* illegality regime is very high. A rule of reason would require a careful factual analysis of the possibility of an anticompetitive effect under the mode of competition and the facts of the case. It would also require a careful balancing between efficiencies and harm. This, they argued, is a costly and uncertain process, and it is more socially efficient not to pursue the practice given the high likelihood of its efficiency enhancing effect.

Ahlborn et al. adopted a similar strong presumption for the efficiency of tying, but propose a framework for a rule of reason approach that require first establishing some necessary conditions are fulfilled to create the possibility that tying has an anticompetitive effect and then that such anticompetitive motivation is plausible. The first stage involves establishing (i) the market power in the tying market, (ii) the oligopolistic nature of the tied market, (iii) the inability of competitors to match the tie, (iii) their inability to survive, (iv) the existence of entry barriers, and (iv) the lack of buyer power. The second stage requires building a theory of harm and checking the facts for its plausibility. Finally, the potential harm needs to be balanced against the effects.[19]

Kuhn et al. (2005) provided a vigorous response to such a strong presumption of legality.[20] They pointed to an erroneous interpretation of some facts, such as the Cournot effect, as being an efficiency-enhancing justification for tying. Also, they pointed out that many of the efficiency defenses relate to competitive markets and are therefore outside of the scope of antitrust policy. The screening criteria they proposed for necessary conditions for harm were (i) market power in one market, (ii) complementarity of the goods, and (iii) asymmetry in product lines. The plausibility assessment requires a coherent theory supported by the facts of the industry, which demonstrate that foreclosure effects are plausible. For this there must be some intertem-

[18] D. Evans, J. Padilla, & M. Salinger, *A Pragmatic Approach to Identifying and Analyzing Legitimate Tying Cases*, EUR. COMPETITION L. ANNUAL 2003: What is an abuse of a dominant position? (2003).

[19] C. Ahlborn, D. Evans, & J. Padilla, *The antitrust economics of tying: a farewell to per se illegality*, 49 Antitrust Bull. 287 (2004).

[20] K. U. Kühn, R.T. Stillman, & C. Caffara, *Economic Theories of Bundling and their Policy Implications in Abuse Cases: An Assessment in Light of the Microsoft Case*, 1 Eur. Competition J. 85-122 (2005).

poral link between the tying practice and the market conditions in the future, such as network effects or R&D investments.

Tirole (2005) also argued for a less lenient approach to tying and recommended that tying be assessed under the rule of reason and in the framework of a predation test.[21]

The acknowledgment of the need for both more sophisticated analysis and the need to define assessment criteria for something more akin to a rule of reason culminated in modernization exercises by antitrust authorities in both Europe and the United States. In Europe this process culminated in 2009 with the European Commission's *Guidance Paper*.[22] In the United States, in 2008, the DOJ issued the *Report on Single-Firm Conduct under Section 2 of the Sherman Act*.[23] Both documents address the issue of tying.

The Commission's *Guidance Paper* recommended that tying be assessed with the criteria used in the *Microsoft* case. The firm must be dominant in the tying market, the tying and tied products must be distinct products for consumers, and the tying must be likely to lead to anticompetitive foreclosure. The *Guidance Paper* identified criteria that increase the likelihood of anticompetitive effects. These are mainly the existence of "durable" tying, including technological tying, dominance in more than one product, and the complementary nature of the products. In the case of multiproduct bundling, the test is akin to predation in that it examines whether an "as efficient competitor " is able to enter any one of the markets. Bundle -to -bundle competition is also evaluated under a predation test.

The DOJ Report cast a more favorable light on the practice of tying by greatly emphasizing its potential efficiencies. It mentioned criteria that impact the likelihood of harm and these are, again, the complementary nature of the product, the presence of scale economies, the possibility to decrease rival's profits in the tied market, and the presence of switching costs. The Report recommended dropping the *per se* illegality and adopting a presumption of positive impact on consumer welfare. Tying should considered illegal only if the potential harm to competition was shown to be "disproportionate" to the potential benefit to consumers.

It is striking to note that, in the end, both the U.S. and European jurisdictions shied away from their own work. In 2009 the DOJ repealed its own report on the grounds that it was biased against the protection of consumer's interest. In 2008, the European Commission had also decided to issue its paper as a guidance document, depriving it of the more authoritative status of formal guidelines. These actions were clear testimony of a general uneasiness by regu-

[21] J. Tirole, *The Analysis of Tying Cases*: *A Primer,* 1 (1) COMPETITION POL'Y INT'L (2005).

[22] Communication on the Guidance on the Commission's enforcement priorities in applying Art.82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings. OJEU C 45/7 of 24.2.2009.

[23] http://www.justice.gov/atr/public/reports/236681.htm.

lators about adopting a framework that might have been more lenient toward tying practices for lack of a solid enough framework to effectively demonstrate their possible harm.

## IX. Challenges Ahead

Tying and bundling seem to be ever more common commercial and technological practices. There is an increased level of sophistication in the provision of new products and services that very often involve bundling and package offers. Efficiency arguments must be playing a large role since this activity is happening in many markets without dominance. Yet this does not mean the practices should not be examined, as arguments relating to the softening of competition or collusive arrangements might apply. Similarly the ability to raise price efficiency is rapidly increasing with technology and information, which may eventually result in questions about the welfare effects of price discrimination. These issues might have to be addressed under consumer policy. In the antitrust field, the information, technology, and communication ("ITC") sector is increasingly developing as a competition between bundles or "ecosystems" in market with high levels of intellectual property rights ("IPR"), high network effects, and high technological change.

Will our analytical tools be sufficient to tackle the level of complexity of the economic and technological interactions in these sophisticated markets? Can we satisfactorily reduce the issues at stake to a dimension tractable by our analytical tools? Will there be further progress in our economic analysis?

Today, the limitations of rational decision models and the insurmountable problems of dealing with insufficient information in game theory are motivating new areas of research. The analysis of complex systems is also timidly spilling over from natural science into economics. What natural science brings is a world of non-equilibrium and adaptive behavior. Complex game theoretical approaches are already being developed where actors, in the presence of very high costs of collecting and processing information, develop rules for decision-making that may be non -optimal but may be effective. In adaptive game theory, actors in highly networked, highly heterogeneous, and highly non-linear environments learn, adapt their behavioral rules, and then fail or survive.

It will be very difficult to find a formalization of complex economics that is tractable enough to be useful in policy, and we can expect rational decision -making and the basis of neoclassical economics to stick around for a while. The search for rule of reason criteria based on the current analytical framework is, for the moment, the best we have. But the legacy of Whinston's article is also to remind us that, at any point in time, a piece of research can come

that will impact minds and change opinions.

## X. Conclusion

*Antitrust analysis has evolved accordingly even though the legal community seems to have paused in the face of so much indeterminacy.*

Whinston's *Tying, Foreclosure, and Exclusion* article represented a milestone in the literature of tying. At a time when the debate seemed to be between an outright condemnation or an outright acceptance of the practice of tying, Whinston created a richer and better framework to illustrate the complexity of the matter. All subsequent research has drawn inspiration in one way or another from the basic framework he laid out.

Antitrust analysis has evolved accordingly even though the legal community seems to have paused in the face of so much indeterminacy. Still, in any particular case, practitioners should not shy away from relying on a careful analysis of the facts. The literature of tying is full of such guidance for a reasoned analysis of tying. The courts may eventually move towards a full rule of reason. The use of such rule of reason in policy-making should, nonetheless, be embedded in an environment that remains open to learning. This is the big lesson of the Whinston article and one that we need to embrace.