

A TYING PERSPECTIVE ON APPLE, THE IPHONE, AND THE APP STORE



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A Tying Perspective on Apple, the iPhone, and the App Store

By Michael Waldman

Significant attention has recently been paid to Apple's behavior concerning the iPhone and App Store. In this paper, I employ economic theory concerning tying behavior to better understand the economic forces behind Apple's behavior, and the extent to which intervention is justified. I identify three plausible motivations for Apple's behavior – efficiency, price discrimination, and leveraging its market power – and discuss what each suggests concerning whether intervention is justified. The conclusion is that only the leverage argument provides a plausible rationale for intervention. In addition, this argument suggests that the case for intervention is stronger if Apple's tying behavior concerning the iPhone and App Store significantly negatively affects the supply of apps.

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I. INTRODUCTION

Apple's behavior concerning the iPhone and the App Store has attracted significant antitrust scrutiny. This includes the recent *Apple-Epic* case, attention from both U.S. and European antitrust authorities, and scrutiny from the U.S. Congress which is considering updating U.S. antitrust laws. This raises a number of related questions. Is this attention justified? Is Apple violating the antitrust rules in either market? Should Apple be forced to change its behavior concerning the iPhone and the App Store?

In this paper, I shed light on these questions by discussing what the economic theory of tying tells us about Apple's behavior. As I discuss in the next section, there are aspects of this case that are not captured by the traditional literature on tying. Nevertheless, my belief is that most of the economic forces underlying Apple's behavior can be understood by viewing the behavior using a "tying lens." Also, the behavior raises legal issues, but those issues can only be properly understood when the economics is clear. Understanding the economics is what this paper is about.²

II. BACKGROUND

The smartphone market in the U.S. is dominated by two firms – Apple and Samsung – and there are significant switching costs associated with moving from one firm's smartphone to a competing firm's smartphone. Given the high profits the two major sellers earn in operating in this market, it seems reasonable to treat Apple's behavior concerning iPhones and the App Store from the standpoint of monopoly behavior. In other words, much of what I say below is based on the literature concerning tying in monopoly markets. But simple extensions of the models in the papers cited would show that the arguments apply in duopoly settings, where because of switching costs and an installed base each firm has significant market power. Also, for most of the discussion I do not focus on the two-sided nature of the markets. In terms of the basic economics important for understanding the economic forces driving Apple's behavior, I think it is arguments in the traditional tying literature which are most important. I come back to this issue later.

Apple employs an "almost" irreversible tie of the App Store to iPhones, i.e. the App Store is pre-installed on iPhones and no competing app store (such as the Google Play Store or the Epic Game Store) is allowed to be installed on an iPhone. This is not a fully irreversible tie, since in many cases one can purchase an app elsewhere (or in some cases download the app for free) and have it installed on the user's iPhone. However, downloading an app onto an iPhone after purchasing the app from a different app store is not as convenient as downloading it from the App store. As a result, many iPhone owners download apps for use on their iPhones predominantly from the App Store, and do not treat alternative ways of downloading apps for use on their iPhones as important substitutes.³

As indicated, the App Store is pre-installed on iPhones and there is no separate charge for the App Store app. However, this does not mean that Apple earns zero profits from the App Store. Far from it. Apple receives 15 or 30 percent of the price when an app is purchased from the App Store, and also receives 15 or 30 percent of later charges associated with use of the app, i.e. in-app payments, where these subsequent payments are substantial for many apps.⁴ Given that the costs of maintaining and upgrading the App Store over time are relatively low, it is estimated that the App Store is a very profitable product for Apple. Note, however, (as emphasized by Apple) that similar fee structures are standard in the industry.

A related point is that from a theory standpoint, having the App Store pre-installed on iPhones with a fee for apps purchased is just one avenue through which Apple can monetize apps used on an iPhone. In particular, even in the absence of such fees, more apps and higher quality apps makes an iPhone a more attractive product for many consumers. So a second way that app availability can be monetized is through a higher iPhone price.

² It would be more precise to describe Apple's tie as being between iOS, which is a mobile operating system exclusive to Apple's hardware, and the App Store. However, from an expositional standpoint, in terms of applying the tying literature to this case, it is more straightforward to describe the tie as being between the iPhone and the App Store, rather than iOS and the App Store.

³ One method for installing apps on an iPhone without using the App Store is to jailbreak the device, i.e. using software available on the web to break the lock that Apple places on iPhones. However, this voids the warranty and stops normal updating of the device. There are also sideloading techniques that do not involve jailbreaking the device, but these techniques are more complicated than purchasing an app from the App Store, especially for users who are not particularly tech savvy.

⁴ Currently, a 15 percent fee is charged for the first million dollars in sales of an app developer, and 30 percent for additional sales. Earlier the fee was a flat 30 percent. Apple enforces these charges by requiring iPhone users who purchase an app or make in-app payments using the iPhone to employ Apple's payment system. To be precise, therefore, this paper is about Apple's tie of the App Store to the iPhone in combination with the required use of Apple's payment system.

III. THE CHICAGO SCHOOL AND RELATED ARGUMENTS

Viewing Apple's behavior concerning the iPhone and the App Store from the perspective of tying theory, the first argument that comes to mind is the classic Chicago School argument concerning tying (see, for example, Director & Levi (1956),⁵ Bowman (1957),⁶ Posner (1976),⁷ and Bork (1978)).⁸ Think of the iPhone as the monopolized primary or tying product, and the App Store as the tied product. The Chicago School argument is that Apple's motivation for the tie cannot be extending its market power in the tying product to the tied product, because it can achieve all potential monopoly profits by optimally pricing the tying product, i.e. the iPhone.

To see the logic, consider a monopolist of left shoes in a setting in which right shoes are sold competitively. Suppose there are no efficiency reasons for tying and assume a one-period setting. The Chicago School argument is that the monopolist can do just as well selling left shoes only and letting consumers purchase right shoes from the competitive industry, as it could by selling pairs of shoes. Let P^* be the monopoly price for pairs of shoes, and P^R the competitive price for right shoes. The monopolist can set the price for left shoes at $P^* - P^R$, and the outcome in terms of monopoly profits, the consumer price for pairs of shoes, and total sales would be the same as if the monopolist sold pairs of shoes. The conclusion drawn is that, if we observe tying in this type of setting, the presumption should be that there is an efficiency rationale.

Whinston (1990)⁹ employs a formal game theoretic approach to investigate the robustness of this argument (see also Ordover, Sykes & Willig (1985)).¹⁰ He considers a one-period setting in which there is a monopolist of a primary good, a complementary good that can be produced both by the monopolist and a rival producer, constant marginal costs of production for the two goods, and a fixed cost for the production of the complementary good. He also assumes that ties are irreversible meaning that, if the monopolist ties or bundles the complementary good with sales of the monopolized primary good, then consumers cannot add the rival's complementary good. Whinston shows that in this setting the Chicago School argument is correct if the primary good is essential for all uses of the complementary good. That is, if the only demand for the complementary good is for combining it with the monopolized primary good, then the Chicago School argument applies. The monopolist does just as well pricing the primary good optimally and not tying, as by tying the complementary good to sales of the primary good.

As just discussed, Whinston (1990) shows conditions for which the Chicago School argument applies, but that paper and later papers show that the Chicago School argument will sometimes not apply when those conditions are not satisfied. Further, some of the analyses which investigate when the Chicago School argument does not apply are potentially relevant for understanding Apple's behavior concerning the iPhone and App Store.

One condition that Whinston finds is key for the Chicago School argument to apply, which clearly does not hold in the iPhone-App Store setting, is that the monopolized primary good is essential for all uses of the complementary good. Clearly, there are app stores such as the Google Play Store for which there is demand outside of the store being uploaded as an app onto an iPhone. A number of papers show that when the primary good is not essential for all uses of the complementary good, then there can be a return to tying to leverage market power into the complementary good market.

One such analysis appears in Whinston's 1990 paper, where he extends his basic analysis described above by adding a use for the complementary good that does not require the primary good. Here he shows that, if economies of scale in the production of the complementary good are important, then the monopolist may tie because tying reduces the size of the rival's potential sales and the rival then exits the complementary good market due to the economies of scale. In other words, tying extends the monopoly position in the primary market to the complementary good market. Whinston (1990) and Nalebuff (2004)¹¹ also show related results in models where the two products are independent rather than complementary.

⁵ Director, A. & E.H. Levi, "Law and the Future: Trade Regulation," *Northwestern University Law Review*, 1956, 51, pp. 281-296.

⁶ Bowman, W.S., "Tying Arrangements and the Leverage Problem," *Yale Law Review*, 1957, 67, pp. 19-36.

⁷ Posner, R.A., *Antitrust Law, An Economic Perspective*, Chicago, IL: University of Chicago Press, 1976.

⁸ Bork, R.H., *The Antitrust Paradox: A Policy at War with Itself*, New York: Basic Books, 1978.

⁹ Whinston, M.D., "Tying, Foreclosure, and Exclusion," *American Economic Review*, 1990, 80, pp. 837-859.

¹⁰ Ordover, J.A., A.O. Sykes & R.D. Willig, "Nonprice Anticompetitive Behavior by Dominant Firms Towards the Producers of Complementary Products," In F.M. Fisher, ed., *Antitrust and Regulation: Essays in Memory of John J. McGowan*, Cambridge, MA: MIT Press, 1985.

¹¹ Nalebuff, B., "Bundling as an Entry Barrier," *Quarterly Journal of Economics*, 2004, 119, pp. 159-188.

Another related analysis appears in Carlton & Waldman (2002).¹² That paper considers two-period models in which the monopolist's primary good is not essential in the sense that the rival has the potential to enter the primary good market in the second period. In other words, in the first period the monopolist's primary good is essential, but there is potential entry into the primary market in the second period, and the possibility of such entry means the monopolist's primary good is not essential in the second period. Carlton & Waldman show that, given either economies of scale or network externalities, tying can arise in such a setting because it can serve to stop entry into the primary market, and thus preserve the firm's primary market monopoly. Note that Whinston (1990) contains a related analysis in which tying does not stop entry into the primary market, but rather eliminates as a substitute a competitively supplied inferior primary product.¹³

Another condition which is important for the Chicago School argument to apply is the assumption in Whinston's (1990) basic analysis that the goods are consumed in fixed proportions. This condition is arguably also not satisfied in the iPhone-App Store setting. That is, although a single App Store app appears on the typical iPhone, the idea that the revenue generated by the app varies significantly across consumers means the setting more closely resembles a setting consistent with variable proportions between the primary and complementary goods, rather than fixed proportions.

When products are consumed in variable proportions, rather than fixed proportions, tying can sometimes be used to price discriminate via what is commonly referred to as metered sales. The basic argument was first put forth to explain IBM's behavior in a famous 1936 case concerning punch cards and tabulating machines (see also Chen & Ross (1993)¹⁴ and Klein (1993)).¹⁵ Suppose that some consumers of the primary or potentially tying product are heavy users of the complementary good, while other consumers are lighter users. If the consumers who are more intensive users of the complementary good are also the high valuation consumers, then the monopolist can frequently increase profits by tying and setting a high price on units of the complementary good. The basic idea is that tying in this case allows the monopolist to more effectively price discriminate, i.e. the high valuation consumers make higher total payments than other consumers, because they purchase a higher number of the high priced complementary good.

Note that Stigler (1963),¹⁶ as well as later papers such as Schmalensee (1984),¹⁷ McAfee, McMillan, & Whinston (1989),¹⁸ and Bakos & Brynjolfsson (1999),¹⁹ explore another price discrimination related argument for tying. In this argument, tying is used to reduce heterogeneity concerning consumer valuations. These models do not satisfy Whinston's condition that there is an essential primary good. In terms of understanding Apple's behavior, this argument seems less relevant than the metered sales argument. That is, valuations in the iPhone-App Store case are likely positively correlated, which is more consistent with the metered sales argument, rather than this alternative concerning reducing consumer heterogeneity.

A third condition assumed by Whinston (1990) in his basic analysis that is important for the Chicago School argument to hold is that all sales occur simultaneously (this is an implicit condition of Whinston's analysis given his focus on one-period models). Carlton & Waldman (2012) consider tying in a two-period durable goods setting in which the complementary good can be produced both by the primary good monopolist and a rival, where the complementary good can be upgraded in the second period.²⁰ Upgrading in their analysis means that each firm has the ability to invest in research and development concerning complementary good quality, and then offer a higher quality complementary good in the second period. Note that upgrades over time of the App Store and other app stores is a common feature of that market, and new apps and upgraded apps over time can also be potentially thought of as complementary good upgrades i.e. upgrades of the App Store, when applying this

12 Carlton, D.W. & M. Waldman, "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," *Rand Journal of Economics*, 2002, 33, pp. 194-220.

13 Another argument in which tying arises where the monopolist's primary good is not essential is found in Carbajo, de Meza & Seidman (1990). In that argument goods are independent, rather than complementary, and tying is used to increase product differentiation in the tied good market.

14 Chen, Z. & T. Ross, "Refusals to Deal, Price Discrimination, and Independent Service Organizations," *Journal of Economics and Management Strategy*, 1993, 2, pp. 593-614.

15 Klein, B., "Market Power in Antitrust: Economic Analysis After Kodak," *Supreme Court Economic Review*, 1993, 3, pp. 43-92.

16 Stigler, G.J., "*United States v. Loew's Inc.*: A Note on Block Booking," *Supreme Court Economic Review*, 1963, 1963, p. 152-157.

17 Schmalensee, R., "Gaussian Demand and Commodity Bundling," *Journal of Business*, 1984, 57, S211-S230.

18 McAfee, P., J. McMillan, & M.D. Whinston, "Multiproduct Monopoly, Commodity Bundling, and Correlation of Values," *Quarterly Journal of Economics*, 1989, 93, pp. 371-383.

19 Bakos, Y. & E. Brynjolfsson, "Bundling Information Goods: Pricing, Profits and Efficiency," *Management Science*, 1999, 45, 1613-1630.

20 Carlton, D.W. & M. Waldman, "Upgrades, Switching Costs and the Leverage Theory of Tying," *Economic Journal*, 2012, 122, pp. 675-706.

analysis to Apple's behavior.²¹

The main result of this analysis is that, if the complementary good is sold rather than leased, then tying will increase monopoly profitability when the value consumers place on the second period upgrade is sufficiently high. The logic is that, because the upgraded complementary good is sold at a later date than the monopolized primary good, the primary good price cannot capture all the surplus associated with the complementary good upgrade. So to capture this surplus, the primary good monopolist must be the firm that sells the upgrade, which the monopolist can guarantee by employing an irreversible tie that stops consumers from adding the rival's complementary product. In other words, in this case tying is profitably used by the primary good monopolist to leverage its market power into the complementary good market, where the driving force is capturing surplus associated with complementary good upgrades.²²

IV. THE IPHONE-APP STORE TIE

In the previous section, I reviewed the classic Chicago School argument concerning tying, and then discussed various reasons for tying that can arise when the conditions needed for the Chicago School argument to apply do not hold. As briefly mentioned in that discussion, a number of these arguments potentially apply in the iPhone-App Store setting. In this section, I discuss in more detail which of these theories may be the most relevant for understanding Apple's behavior concerning the iPhone and App Store, and what that potentially means for social welfare. At the end of the section, I also briefly discuss potential issues concerning directly applying the lessons of the mainstream literature on tying to the iPhone-App Store setting. This discussion, as emphasized earlier, focuses on economics not the application of the antitrust law.

Before discussing which tying theories are most relevant for understanding Apple's behavior concerning the iPhone and App Store, let me briefly point out that Apple's own explanation for the irreversible tie is an efficiency rationale. In particular, if apps are uploaded to an iPhone which have any of various security problems such as malware, there would be a potential cost to Apple because the demand for their iPhones might be hurt. The App Store is designed to filter out unreliable apps of this sort, and Apple argues that it does not trust rival app store developers to be sufficiently concerned about this issue. Note that this argument is similar to an argument that IBM made to justify its tying in the 1936 punch card and tabulating machine case. That is, in that case IBM argued that if consumers were to purchase punch cards from alternative producers of punch cards, the cards would not be guaranteed to be sufficiently high quality. The result, in turn, would be damage to IBM's reputation in the tabulating machine market, and reduced profitability in that market. I come back to Apple's own explanation for its behavior in the next section.

I now consider the strategic rationales for tying discussed in Section III. In one set of models tying is used to either preserve or enhance the firm's monopoly position in the primary market. In terms of the iPhone and the App Store, that argument translates into Apple irreversibly tying the App Store to the iPhone in order to reduce the quality and availability of alternative app stores, which in turn hurts rival smartphone producers and increases the demand for the iPhone. The evidence suggests this is not the correct explanation for Apple's irreversible tie concerning the App Store. There are numerous alternative app stores, and it seems unlikely that Apple's tie has a substantial effect on the quality and availability of these alternatives. Also, Samsung has its own app store (but does not employ an irreversible tie), so any perceived negative effect on the quality of Android phones would seem to be quite limited.

On the other hand, the idea that the tie is driven or at least partially driven by the desire to more effectively price discriminate through metered sales seems quite plausible. iPhone owners surely vary in terms of their valuation for an iPhone, and it also seems likely that those with a higher valuation, on average, use more apps and pay more for apps. Since Apple has limited ability to price discriminate directly through its pricing of the iPhone, this seems exactly the type of setting where the firm can increase its profits by employing an irreversible tie and practicing metered sales.

21 In this analysis, the monopolist's primary good is essential for all uses of the complementary good, so the earlier result concerning the Chicago School argument breaking down when the monopolist's primary good is not essential does not apply here.

22 Choi & Jeon (2021) in a recent paper use a related argument to show how tying can arise to leverage market power in two-sided markets when there are non-negative price constraints. Choi, J.P. & D-H. Jeon, "A Leverage Theory of Tying in Two-Sided Markets with Nonnegative Price Constraints," *American Economic Journal: Microeconomics*, 2021, 13, pp. 283-337.

The idea that tying can be profitable given complementary good upgrades may also be relevant for understanding Apple's behavior concerning the iPhone and App Store.²³ Clearly, there is upgrading of the App Store and competing app stores over time, and there are R&D investments associated with the upgrading. This is exactly the type of setting, as Carlton & Waldman (2012) show, in which a producer with substantial market power in a primary good market may tie in order to leverage that market power into a complementary good market. One could also argue that development of new and upgraded apps over time is in a sense an upgrading of the App Store and alternative app stores over time. This serves as a further reason to think that tying to leverage market power in the presence of complementary good upgrades could be important for understanding Apple's behavior concerning the iPhone and App Store.

In terms of social welfare, it is well known that an improved ability to price discriminate has an ambiguous effect on social welfare. So to the extent that the iPhone-App Store tie improves Apple's ability to price discriminate, it is unclear whether the result is an increase or decrease of social welfare. As for the upgrading rationale for tying, Carlton & Waldman (2012) find in their formal analysis that tying in this type of setting can lower social welfare if the rival's complementary good is superior. However, as I discuss below, although the Carlton & Waldman analysis is helpful for understanding that tying to leverage market power into a complementary good market may be important in driving the iPhone-App Store tie, fully understanding the social welfare implications of the leverage argument in this case requires going beyond their formal analysis.

There are a few aspects of the iPhone-App Store tie that make the traditional tying literature, which is my focus above, not directly applicable to the situation. One difference was mentioned earlier. Most of the papers in the traditional tying literature discussed above concern tying by a firm with a monopoly position in one or more markets. Clearly, Apple is not a monopolist in the smartphone market since Samsung has a strong market position. However, the high profits of these two firms in the industry suggest they are charging far above marginal cost for their products, and high switching costs and large consumer installed bases suggest that behavior can be understood by using a lens associated with the presence of market power. So I do not consider the non-monopoly nature of Apple's market position in this market a real concern in terms of employing the tying literature to understand behavior in this case.

A second difference between the iPhone-App Store case and the traditional tying literature concerns the nature of the complementary product. The product is itself a store whose value to consumers depends to a great extent on the quantity, quality, and prices of the apps available at the store. This aspect of the setting is not captured in standard models of tying. In a standard model in which a complementary good is tied to a monopolized primary good, the quality of the complementary good depends solely on the R&D expenditures on product quality of the good's producer. But in the iPhone-App Store case, the quality of the App Store in a sense depends on the quantity, quality, and prices of the apps produced by other firms.²⁴

Why is this important? When Apple irreversibly ties the App Store to the iPhone, it likely moves some revenue from app producers to Apple. For example, an important substitute to the App Store for purchasing an Epic Game such as Fortnite is the Epic Game Store. So when Apple irreversibly ties the App Store to the iPhone and more Epic games are purchased at the App Store, which charges a 15 percent or 30 percent fee, some revenue is moving from the game developer to Apple. One might suspect that this hurts social welfare because Epic will have a smaller incentive to invest in game development. However, there is a countervailing effect to the extent that Apple's incentive to invest in iPhone and App Store quality should be enhanced, and this includes investments by Apple that improve app performance. It is unclear from a purely theoretical standpoint which of these social welfare effects is larger. But given the substantial revenue flows to app developers, even if the net effect on social welfare is negative, I suspect the effect is small.²⁵

23 The evidence suggests that the leverage argument in which the tie reduces the availability of rival complementary products is not applicable to this case. As argued above, there are numerous alternative app stores, and the quality and availability of these alternatives is likely little affected by Apple's tie.

24 A third difference between models in the standard tying literature and the iPhone-App Store setting is that consuming an app on an iPhone, such as a game like Fortnite, is not necessarily a perfect substitute for consuming it on a different device such as a personal computer. One reason is that there may be times when a consumer has access to her iPhone but not to her personal computer. I suspect this introduces a rationale for Apple to tie the App Store to the iPhone for leverage reasons which is in addition to the Carlton & Waldman (2012) argument. However, I am not familiar with any paper that specifically models this aspect of the iPhone-App Store setting, e.g. Choi's (2010) paper on tying and multi-homing does not capture it, and providing a formal game theoretic analysis which captures how tying would work in such a setting is beyond the scope of the current paper. Choi, J.P., "Tying in Two-Sided Markets with Multi-Homing," *Journal of Industrial Economics*, 2010, 58, pp. 607-626.

25 One could also argue that social welfare is hurt because the 15 or 30 percent fee that Apple charges for apps and in-app payments causes prices to rise. But if the marginal costs for apps and in-app payments are close to zero which is likely the case, standard pricing theory suggests the fees charged should have little or no effect on pricing. However, some argue, including the European Commission, that the fee has resulted in higher prices.

V. ANTITRUST POLICY

The Supreme Court in 1984 in the *Jefferson Parish* case ruled that tying is *per se* illegal if certain conditions are met. For example, one condition is that the seller must have significant market power in the tying market, while another is that the tie forces consumers to buy the tied product. Since in practice the exact meaning of the conditions needed for the *per se* ruling to apply is unclear, the courts have frequently taken a rule of reason approach that balances possible efficiencies with anticompetitive effects.

As mentioned earlier, Apple argues that the iPhone-App Store tie is needed to stop unsafe apps from being downloaded onto iPhones, while critics argue that alternative app stores can be just as effective in avoiding unsafe apps. I do not have any special expertise concerning whether Apple or instead its critics are correct concerning this issue. However, if the courts were to determine that Apple's arguments concerning security issues are a valid concern, then a high hurdle should be imposed concerning potential anticompetitive effects needed for a ruling against Apple concerning its tying behavior.

In Section IV I identified two non-efficiency-based reasons that are plausibly motivating Apple's tying behavior. The first is price discrimination via a metered sales type argument. If the courts were to decide this is the main motivation, my view is that the behavior should be allowed. Price discrimination in general has ambiguous social welfare consequences. But since perfect price discrimination maximizes social welfare, practices that increase a firm's ability to price discriminate should tend, on average, to improve social welfare. Further, identifying whether Apple's tie violates this average tendency and, in fact, hurts social welfare seems beyond what the courts can determine with any confidence. So the best policy would seem to be not to intervene if it is ruled that price discrimination is the main driving factor.

The second non-efficiency-based rationale for the iPhone-App Store tie identified in Section IV is that the tie may be used to leverage market power into the app store market, due to the presence of complementary good upgrades. As I discussed, in this case the tie arguably hurts social welfare, especially if the redirection of revenues from app developers to Apple serves to significantly reduce the quantity and quality of available apps. As pointed out earlier, however, I am somewhat skeptical that any potential negative effect is large given the substantial revenues that flow to app developers. However, if the courts found that the effect on the supply of apps was significant, there might be a reasonable case for the courts to intervene and rule that the tie is illegal.

VI. CONCLUSION

Why does Apple irreversibly tie the App Store to the iPhone, and what is appropriate antitrust policy concerning Apple's behavior? In this paper, I shed light on these issues by discussing what the traditional literature on tying tells us about the economic forces driving Apple's behavior. After reviewing the relevant tying literature, I argue that there are a number of possibilities concerning what is driving Apple's behavior – efficiency motivations, price discrimination, and leveraging its market power. I then argue that for only one of these possibilities – the leverage theory – is there a plausible argument to be made that the courts should intervene to stop the behavior. The logic is that the leverage theory suggests that the tie may decrease social welfare, especially if the tie hurts the quantity and quality of apps available. So as the courts, antitrust authorities, and the U.S. Congress focus on Apple's tying behavior and whether intervention is justified, attention should be paid to whether the evidence supports the leverage argument and, if it does, how much does the tie affect the supply of apps.



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