Evaluating Mergers for Coordinated Effects and the Role of "Parallel Accommodating Conduct"*

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Abstract

The *2010 Horizontal Merger Guidelines* propose a form of coordinated effects, referred to as "parallel accommodating conduct," that is claimed not to involve the usual evaluation of the ability of firms to detect compliance and punish non-compliance with respect to supracompetitive prices. That claim is argued here to be false. Where the concept of parallel accommodating conduct is valid and constructive is in identifying coordinated effects that do not involve firms having an agreement. These issues are explored here in the context of a more general examination of how firms coordinate on and implement supracompetitive outcomes.

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1 Introduction

Jointly issued by the U.S. Department of Justice and the Federal Trade Commission, the *2010 Horizontal Merger Guidelines* (HMGs) are thoughtful, constructive, and insightful. In a document that touches upon so many challenging and well-examined issues, it is inevitable that one will find it difficult to agree with everything in it. This comment will critically examine one small but significant departure from previous guidelines.

One of the fresh additions to the new guidelines is that they expand the class of behavior categorized under "coordinated effects":

> Coordinated interaction can involve the explicit negotiation of a common understanding of how firms will compete or refrain from competing. Such conduct typically would itself violate the antitrust laws. Coordinated interaction also can involve a similar common understanding that is not explicitly negotiated but would be enforced by the detection and punishment of deviations that would undermine the coordinated interaction. Coordinated interaction alternatively can involve parallel accommodating conduct not pursuant to a prior understanding. Parallel accommodating conduct involves situations in which each rival's response to competitive moves made by others is individually rational, and not motivated by retaliation or deterrence nor intended to sustain an agreed-upon market outcome, but nevertheless emboldens price increases and weakens competitive incentives to reduce prices or offer customers better terms. Coordinated interaction includes conduct not otherwise condemned by the antitrust laws.[1]

The departure from previous guidelines resides in the inclusion of *parallel accommodating conduct* (PAC). As described, PAC is distinct from other forms of coordinated effects in that it is not based on "retaliation or deterrence" and does not rely on "an agreed-upon market outcome."

To set the stage for analyzing PAC, let's begin with a brief review of unilateral and coordinated effects for mergers. Suppose firms A and B offer products α and β, respectively, and decide to merge. The merger creates an incentive to raise the prices of those two products. Prior to the merger, firm A chose the price on product α to maximize the profit generated by product α. That a higher price on product α would also raise the demand and profit of product β was of no consequence to firm A. However, given that the merged firm benefits from the profits generated by both products α and β, it internalizes the effect of the price of product α on the profit coming from product β and, as a result, now prices product α higher relative to the pre-merger situation. This *unilateral effect* is present when the prices of the

[1] *Horizontal Merger Guidelines* (2010), pp. 24-25.

non-merged firms are held constant, and is magnified - both in terms of the positive impact on the merged firm's profit and the negative impact on consumer surplus - when the non-merged firms optimally raise their prices in response to the higher prices charged by the merged firm.

As just described, the unilateral effect of a merger results in higher competitive prices (assuming, of course, the merger does not generate offsetting effects due to cost reductions). If the merged firm were to raise its prices beyond those new competitive prices, that would prove unprofitable *unless* it anticipated that those price increases would induce the non-merged firms to act in a similar fashion and raise *their* prices. But a non-merged firm would only find such a price increase profitable if it was similarly anticipated to occur along with price increases by the merged firm and other non-merged firms. These are *coordinated effects* because the profitability of each firm's price increase relies upon the other firms also raising their prices. As stated in the HMGs (p. 24), coordinated interaction is "conduct by multiple firms that is profitable for each of them only as a result of the accommodating reactions of the others."

The generation of coordinated effects requires firms to solve two challenges: *coordination* and *implementation*. Firms must *coordinate* on a supracompetitive outcome (for there are many such outcomes), and they must *implement* that outcome in the sense of having a self-enforcing mechanism that will make it in each firm's best interests to select the supracompetitive outcome. Section 2 focuses on the implications of PAC for merger analysis with regards to the conditions for implementation of supracompetitive prices. There it is argued that there is no substantive change because, contrary to the claim in the HMGs, PAC does involve "retaliation or deterrence" and thus an evaluation of PAC-generated coordinated effects would need to be conducted along standard lines. Section 3 examines PAC in light of the coordination challenge and there it is argued that PAC has something new and valuable to offer to merger evaluation. After reviewing how firms can achieve the mutual understanding needed to produce coordinated effects, some operational implications of PAC for merger analysis are offered. That section concludes by reviewing some recent research relevant to evaluating how a merger might affect the ability of firms to solve the coordination challenge.

2 Implementation of a Supracompetitive Outcome

In the HMGs, a distinction is drawn between when price increases that take prices beyond the competitive level are "enforced by the detection and punishment of deviations" (commonly associated with explicit and tacit collusion) and when they are "not motivated by retaliation or deterrence" (which the HMGs associate with parallel accommodating conduct). In considering this distinction, the theory of collusion tells us that a supracompetitive outcome is sustainable only if it is self-enforcing; that is, each firm prefers to abide by the supracompetitive outcome rather than deviate

from it where a deviation could mean, for example, undercutting the supracompetitive price or bidding for the business of another firm's customers.[2] As originally laid out in Stigler (1964), if a firm is to find it profitable to implement the supracompetitive outcome, it must anticipate that deviation from that outcome is sufficiently likely to be detected ("detection") and that evidence of non-compliance is followed with a sufficiently lower future profit stream ("punishment"). Thus, compliance by firms occurs when each firm prefers to choose the supracompetitive outcome rather than undermine it and earn higher current profit in exchange for a lower future profit stream. Depending on the circumstances, this lower future profit stream can take various forms including, for example, a temporary or indefinite return to the competitive outcome, a temporary stay at an outcome even less profitable than the competitive outcome ("price war"), or a transfer of profits from the non-compliant firm to the other firms by the former buying output from the latter.

With PAC, the HMGs are suggesting that there is a form of coordinated effects that can arise without concerns of behavior being monitored and of non-compliance inducing a lower future profit stream for the deviating firm. It is here that I disagree. If a firm is expected to price above the competitive level - and thereby price higher than that which maximizes current profit - what is to induce it to do so? Foregoing current profit can only be rationalized by the prospect that failure to do so will result in a lower future profit stream. That this is, in fact, the mechanism underlying PAC is made clear when it is described how PAC works. In a speech in 2010, Carl Shapiro (2010, p. 27) - who, along with Joe Farrell, are the chief architects of the new HMGs - discusses a hypothetical merger that could result in the merged firm becoming the "industry price leader" and that the merged firms' two rivals "will likely follow price increases that it initiates." He goes on to say:

> This pattern of behavior does not involve any agreement that the merged firm will punish the other two firms if they fail to follow; but all three firms know that the merged firm will likely rescind its price increases in that event.

What makes it individually rational to follow the price increase is that, as Shapiro says, failure to do so will result in the merged firm lowering its price. In other words, a firm can match the price increase and expect to earn higher profit indefinitely or it cannot match it and receive higher current demand and profit (by pricing below the merged firm) and lower future profits (as the merged firm rescinds its price increase). This trade-off is exactly what underlies the stability of collusion: failure to comply with supracompetitive outcome results in a lower future profit stream. It is simply wrong to say that:

[2]For an excellent non-technical discussion of the theory of collusion, see Motta (2004).

> the HMGs now acknowledge the possibility that a merger might facilitate coordination ... even in the absence of a mechanism to detect and punish deviant firms.[3]

The entire argument for the efficacy of PAC relies upon firms' prices being easily observed (so that failure to match a price rise is *detected*) and, in response to not following a price increase, the price leader lowers its future price (so that failure to match a price rise is *punished*). While one might retort that the price leader's rescinding its price increase is hardly worthy of the term "punishment," the expression "punishment" in the theory of collusion is nothing more than short-hand for a lower future profit stream and need not imply anything harsh - like a price war - though is often associated with it.[4]

Now, does all this really make a difference when it comes to analyzing a merger for coordinated effects? I think it does because, as stated, the HMGs suggest - and have been interpreted to mean - that an analysis of the propensity of a merger to induce PAC does not involve the relevant factors identified by the theory of collusion. If the capacity to detect and punish are irrelevant for producing PAC, then the likelihood of PAC is not tied to whether market conditions are conducive to detection and punishment. To the contrary, the following two scenarios show that the usual market analysis regarding coordinated effects is just as relevant when they are generated by PAC.

For scenario #1, consider a market in which the merged firm may act as a price leader with regards to list price. As a result of the merger, is this market prone for PAC? In addressing this question, suppose firms can offer customer-specific discounts off of the list price so that the list price need not be the transaction price. Is there still grounds for PAC? It depends on how easily a firm's discounts are observed by its competitors. If they are easily observed then perhaps PAC could arise where the merged firm is to take the lead with regards to raising list price, all firms are to follow, and firms are not to veer from selling at the list price. If instead discounts are not easily observed then price leadership will probably not work in which case a merger is unlikely to produce PAC. A market analysis is then required to assess whether there is adequate price transparency among firms to sustain PAC; exactly the type of analysis that is done with regards to standard forms of coordinated effects. The suitability of the market for PAC depends on the ability of a firm to determine whether a rival has actually selected the supracompetitive outcome; in other words, *detection* is relevant to an assessment of coordinated effects including PAC.

A recent case for which the preceding discussion is applicable is the 2012 proposed merger of International Paper and Temple-Inland. In its Competitive Impact

[3] Woodbury (2011), p. 5.

[4] In fact, the punishment deployed by many cartels is not a harsh price war but rather a far milder transfer of sales among firms; see Harrington (2006) for some examples. However, as shown in Harrington and Skrzypacz (2011), the threat sustaining the implementation of those transfers may have the harshness of a return to competitive prices.

Statement, the DOJ stated:

> The proposed merger would also likely cause International Paper to engage in parallel accommodating conduct. ... Due to its additional containerboard volume obtained as a result of the merger, International Paper would benefit more from a price increase after the proposed merger. Thus, if a large rival attempted to raise the market price by reducing output, International Paper would likely accommodate its rival's actions by reducing or not increasing its own output. The rival would thus be likely to increase the market price by reducing output after International Paper and Temple-Inland complete the proposed merger.[5]

But how exactly would such an arrangement be enforced? Presumably these companies are negotiating prices with at least their large customers. Would the negotiated prices of its rivals be observed by International Paper so it could subsequently "accommodate"? If the accommodating response was to limit supply, how would that supply response be observed? These questions are of the sort raised when conducting a standard analysis of coordinated effects and answering them requires drawing on the theory of collusion.

For scenario #2, consider a market in which the merged firm may act as a price leader with regards to (transaction) price. As a result of the merger, is this market prone for PAC? Let us suppose the merged firm were to raise price and the other firms did not follow. Further suppose that, with the lower price they are charging relative to the merged firm, they aggressively lock customers into long-term contracts. Of course, the merged firm will rescind its price increase but the impact on the other firms' future profit streams will be minimal if they've already tied up future demand with long-term contracts. Thus, whether PAC is effective depends on how quickly the price leader can rescind its price increase relative to the rate at which its rivals can sign contracts with customers. The suitability of the market for PAC depends on the ability of the market leader to inflict lower future profit upon those firms that do not comply with the supracompetitive outcome; in other words, *punishment* is relevant to an assessment of coordinated effects including PAC.

The preceding analysis is predicated on the competitive benchmark being defined by a static (Nash) equilibrium, which is a price for each firm that maximizes its current profit given the other firms' prices. As long as coordinated effects involve prices above static equilibrium levels then detection and punishment must be involved in sustaining those prices over time. While PAC must then be evaluated within the Stiglerian framework, this is not to say that all coordinated effects rest on detection and punishment. When a market setting has *multiple* static equilibria, coordinated

[5] *United States of America v. International Paper Company and Temple-Inland, Inc.,* U.S. Department of Justice Competitive Impact Statement, U.S. District Court for the District of Columbia, 10 February 2012; pp. 7-8.

effects can arise when firms agree to move from a static equilibrium with low prices to a static equilibrium with high prices.

For example, consider the standard Cournot setting in which firms choose quantities, price is set to equate supply and demand, and there are both variable costs and fixed costs (the latter are avoided by exiting the market). This setting can have multiple static equilibria.[6] In particular, it could be an equilibrium for each of n firms to choose quantity to maximize its profit (that is, the static equilibrium with n firms) but there could also be an equilibrium in which each of $n-1$ firms choose quantity to maximize its profit and the n^{th} firm exits the market (that is, the static equilibrium with $n-1$ firms). The intuition for multiplicity is as follows. When a firm is active and expects $n-1$ other firms to be active, it supplies less than when it expects only $n-2$ other firms to be active; fewer competitors means more residual demand for a firm so it produces more. Thus, if each of $n-1$ firms expects the n^{th} firm to exit the market then each could end up supplying at a high enough rate to rationalize that exit; the n^{th} firm would not have residual demand sufficient to earn the variable profit it needs to cover its fixed cost. If instead each of $n-1$ firms expects the n^{th} firm to remain in the market then each will produce at a lower rate which could be low enough to rationalize the n^{th} firm remaining in the market. To consider coordinated effects in this setting, suppose there are initially four firms and firms 1 and 2 merge. The merger could result in a post-merger static equilibrium having the merged firm 1/2 and firms 3 and 4 all being active, or it could have firm 1/2 and firm 3 coordinate to produce at a high enough rate to rationalize firm 4's exit. The merger would then have unilateral effects if there was no subsequent exit - the three remaining firms produce according to a triopoly equilibrium - but would have coordinated effects if the merged firm and another firm agreed to produce at a high rate - consistent with a duopoly equilibrium - and thereby induced a rival to leave the market.

While one might interpret this practice as having exclusionary as well as coordinated effects, there are other settings in which the argument could be made without any exclusionary side to it. All that is essential is that competition (that is, static equilibrium) can result in various outcomes and firms coordinate on selecting one that is harmful to consumers. An evaluation of a proposed merger for such coordinated effects would not draw on the theory of collusion - with its focus on whether market conditions are conducive to detection and punishment and how a merger would impact those conditions - but instead focus on how the merger would make such a coordinated move more likely; only coordination conditions are relevant as implementation conditions are trivially satisfied (given that implementation is achieved simply by each firm maximizing its current profit). Whether the concern about coordinated effects from a merger is due to the possibility of collusion or the coordinated move to a high price static equilibrium, they are common in that the merger is affecting the set of equilibria and coordinated effects arise when the merger impacts the selection of an equilibrium from that set.

[6] The analysis is from Harrington (1987).

3 Coordination on a Supracompetitive Outcome

The HMGs draw a distinction between coordinated interaction for which firms reach an "explicit negotiation of a common understanding," firms achieve "a similar common understanding that is not explicitly negotiated," and firm behavior is not predicated on "an agreed-upon market outcome but nevertheless emboldens price increases" (parallel accommodating conduct). In contrast to the first two sources of coordinated effects, PAC is claimed to be "not pursuant to a prior understanding." In other words, PAC is distinct in how firms solve the coordination challenge associated with achieving a supracompetitive outcome. This distinction is real but subtle. This section begins with a discussion of mutual understanding among firms regarding the setting of supracompetitive prices in terms of what is needed and how it can be achieved. Next, PAC is examined in connection to the coordination challenge and what operational implications it may have for merger analysis. Finally, I conclude with some additional thoughts on evaluating how a merger might affect the ease with which firms solve the coordination challenge.

To begin, my examination of the coordination challenge will focus on the practical concept of *mutual understanding* rather than the legal concept of *agreement*. As it is prosecuted under Section 1 of the Sherman Act, unlawful collusion involves an agreement among firms as reflected in "a conscious commitment to a common scheme designed to achieve an unlawful objective"[7] or a "unity of purpose or a common design and understanding, or a meeting of minds."[8] A narrow interpretation of these judicial statements is that collusion involves firms forsaking conflicting goals - such as increasing market share - for the pursuit of common goals - such as charging a high price. While collusion can take such an unadulterated form, it rarely does and, in fact, collusion can involve continued conflict among firms. Collusive behavior can be as modest as firms not lowering price in response to a cost decrease while continuing to compete aggressively in non-price dimensions such as advertising. What collusion *does* require is that firms have *some mutual understanding* regarding the pursuit of *some common plan* to suppress competition. Coordinated effects do not then require firms to have an agreement in the narrow sense but does require some mutual understanding which has the effect of supracompetitive prices.

To produce coordinated effects, there must eventually be some level of mutual understanding among firms regarding: 1) that they are seeking to produce and maintain a supracompetitive outcome (that is, that they are trying to collude); 2) the properties of the mechanism by which they are colluding (for example, price leadership and matching); and 3) the collusive outcome itself. Firm A is not going to price above the competitive level unless it believes that firm B is likely to do so, and firm B is not going to do so unless it believes it is likely that firm A will do so. Thus, there needs to be some mutual understanding among firms that they will set supracompetitive

[7] *Monsanto Co. v. Spray-Rite Serv. Corp.*, 465 U.S. 752 (1984); 753.
[8] *American Tobacco Co. v. United States*, 328 U.S. 781 (1946); 810.

prices and that these prices will persist because of the presence of a self-enforcing mechanism to sustain them.

Whether firms achieve the necessary level of mutual understanding depends on the initial level of mutual understanding among firms, the devices available to firms to enhance mutual understanding, and the incentives of firms for utilizing those devices.[9] There are a variety of "mutual understanding mechanisms" (MUMs) that firms have used to acquire the common set of beliefs that will produce a supracompetitive outcome.[10] The most efficacious - and the most egregious in the light of the law - is direct verbal communication among firms that ultimately leads to an exchange of assurances that they will raise and maintain prices above the competitive level (or some other outcome that serves to restrain competition). Another device is when a firm publicly announces a strategy which, if adopted by all firms, would produce a supracompetitive outcome.[11] For example, in the one-way truck rental market, the FTC claimed that, during a public announcement regarding earnings, the CEO of U-Haul repeatedly emphasized that U-Haul was demonstrating "price leadership" and was "trying to force prices."[12] Another strategy for producing the requisite mutual understanding is for a firm to take an action that would only be optimal *if* it expected firms to subsequently collude in price. Such a device is argued to have resulted in the mutual understanding that was the basis for collusive pricing in the turbine generator market (Harrington, 2011). General Electric adopted a new pricing policy whereby it no longer negotiated price with customers and instead issued a price book. Such a policy would be distinctly unprofitable if it expected to compete with Westinghouse (as then Westinghouse could simply undercut the price book and take a lot of GE's business) but would be profitable if it expected them to engage in collusive pricing. In fact, Westinghouse responded by adopting the same policy which then served to create the common belief that the two firms would not compete in price. Over the next twelve years, GE acted as a price leader and Westinghouse routinely matched GE's price book.[13]

[9] What the law declares to be coordinated effects in violation of Section 1 of the Sherman Act is determined by the devices used by firms to achieve mutual understanding. Those legal issues will not detain us here but see Kovacic (1993), Werden (2004), and Kaplow (2011) for insightful examinations.

[10] The rudiments of a critical examination of how the law treats these mechanisms can be found in Harrington (2012a).

[11] Interestingly, experimental work finds that one-way communication can be more effective than two-way communciation in producing coordinated behavior in some settings; see Cooper et al (1989, 1992).

[12] *Matter of U-Haul Int'l Inc. and AMERCO* (FTC File No. 081-0157, July 10, 2010). Other notable cases in which this type of MUM was used include *Interstate Circuit, Inc. v. United States, 306 U.S. 208 (1939)* and *Toys "R" Us v. Federal Trade Commission, 221 F.3d 928 (2000).*

[13] Some other cases which I believe involve this same type of MUM - whereby a firm takes an action that would only be optimal if it expected firms to subsequently collude in price - include *C-O-Two Fire Equip. Co. v. United States*, 197 F.2d 489 (Court of Appeals, 9th Cir., 1952); *United States v. Container Corp. of Am.*, 393 U.S. 333 (1969); and *Wall Products Co. v. National Gypsum Co.*

The MUMs mentioned thus far produce an understanding *prior* to firms choosing price. For example, firms verbally communicate or one firm unilaterally announces a collusive strategy and, upon achieving the necessary mutual understanding, firms then set supracompetitive prices. With PAC, the HMGs raise the possibility that coordinated effects can occur even when "not pursuant to a prior understanding." How is this consistent with my claim that coordinated effects require some level of mutual understanding? While there may be no prior mutual understanding (or, more exactly, there is insufficient mutual understanding to produce coordinated effects), the act of a firm acting as a price leader could ultimately generate the mutual understanding that is needed for coordinated effects. This is an argument that can be traced back to Richard Posner, who first stated it as a scholar and then later as a judge in the *High Fructose Corn Syrup* case:

> [O]ne seller communicates his "offer" by restricting output, and the offer is "accepted" by the actions of this rivals in restricting their outputs as well. It may therefore be appropriate in some cases to instruct a jury to find an agreement to fix prices if it is satisfied that there was a tacit meeting of the minds of the defendants on maintaining a noncompetitive pricing policy.[14]
>
> If a firm raises price in the expectation that its competitors will do likewise, and they do, the firm's behavior can be conceptualized as the offer of a unilateral contract that the offerees accept by raising their prices.[15]

If one firm raised its price and the other firms subsequently matched that price then firms could commonly believe that they will engage in price leadership and matching which would produce and sustain a supracompetitive outcome.

Through PAC, the HMGs are then focusing on the possibility that coordinated effects can emerge with little prior mutual understanding among firms. However, I would be hesitant to claim that there could be none. For firm A to take the initiative and raise its price, it must believe it is sufficiently likely that firm B will properly interpret this price increase as an invitation to collude rather than just attribute it to a firm-specific cost or demand shock. This then means that firm A recognizes that firm B is likely to share the belief that they ought to try and collude; there is then some mutual understanding before firm A takes the daring move of raising price. If instead firm A leads by *announcing* a future price increase then there is far less risk to firm A because, if its rivals do not match with a similar announcement, the announcement could be retracted before firm A actually raised its price and lost sales to its rivals. In that case, even less mutual understanding is required in order for

(1971).

[14] Posner (2001), pp. 94-95.

[15] *In Re High Fructose Corn Syrup Antitrust Litigation Appeal of A & W Bottling Inc et al*, U.S. Court of Appeals, 295 F3d 652, (7th Cir., 2002).

a firm to take the lead with the intent of initiating collusion.[16] Still, some common belief as to the collusive mechanism - price leadership and matching, for example - would seem to be necessary though there might be no common belief as to who will lead or at what price. (The implications of that level of mutual understanding will be discussed more fully below.)

In the context of the conditions for coordination, how does PAC affect the evaluation of a merger's potential for producing coordinated effects? While this issue is not explored in the HMGs, let me put forth an argument rooted in PAC meaning price leadership and price matching. A market for which price is very transparent and a firm can react to a rival's price quickly is a market that is especially ripe for coordinated effects because implementation conditions are easy to satisfy and, if price leadership and matching is assumed to be an obvious form of collusion that is likely to be embedded in firms' prior beliefs, then coordination may not to be too difficult. Thus, a market for which price leadership and matching can work is a market for which one should be especially concerned with coordinated effects.

This perspective has implications for merger policy because a merger could be approved with behavioral restraints that make price leadership and matching more difficult. For example, it was the adoption of a policy of no discounting in the turbine generator market that allowed General Electric and Westinghouse to produce collusive prices through price leadership and matching. If one was concerned with such collusive behavior emerging from a merger - such as the one between International Paper and Temple-Inland - then the behavioral restriction could be imposed that firms could not announce policies of no discounting. Or consider the consent decree in the ATPCO case for which airlines (for a span of ten years) could not announce future fare changes except when for widely publicized sales (Borenstein, 2004). If there was a concern that a merger might result in coordinated effects via signalling with advance price announcements then perhaps behavioral restrictions like the consent decree should be put in place. The more general point is that mutual understanding is essential to firms producing coordinated effects and, therefore, competition authorities ought to consider behavioral remedies to make coordination more difficult.[17]

Motivated by the concept of PAC, the preceding discussion emphasized the importance of considering how a merger affects coordination conditions: To what extent does a merger increase the mutual understanding of firms? How does the merger affect the amount of mutual understanding necessary to produce coordinated effects? Are there devices for enhancing mutual understanding? What are the incentives for firms to produce the required mutual understanding? In concluding this section, I

[16] The use of advance price announcements to produce coordinated effects has been observed, for example, in steel (Scherer, 1980), airlines (Borenstein, 2004), and diesel and petrol fuel in Taiwan (Fair Trade Commission, 2004).

[17] In making this suggestion, I do not want to underestimate the difficulty in assessing ex ante the manner in which firms might coordinate. It is one thing to conclude that a merger could produce collusion and quite another to determine how firms would collude in the post-merger environment.

will offer some thoughts pertaining to these questions and, in doing so, draw on some recent research.

Experimental evidence has robustly shown that coordinated effects can emerge in a laboratory market setting without any communication among subjects. Supracompetitive outcomes are common when there are two firms (that is, subjects), very rare with three firms, and non-existent with four or more firms.[18] In these experiments, implementation conditions were satisfied so that, in principle, firms could collude; that is, there were self-enforcing mechanisms that would produce supracompetitive outcomes *if* firms could achieve the requisite mutual understanding. In sum, the experimental evidence supports the hypothesis that achieving mutual understanding regarding collusion is far more difficult with three or more firms than with two firms.

This body of research suggests that a merger resulting in two firms encompassing most of the market could be at significant risk of resulting in coordinated effects. Compare the situation in which firm A raises price (in the spirit of PAC) when there are two rivals and when there is just one. With rivals B and C, not only does firm B have to properly interpret firm A's price rise as an invitation to collude but it must also believe that firm C has such an interpretation; analogously so for firm C. At a minimum, firm A is probably not going to raise price unless it believes: 1) firms B and C will interpret it as an invitation to collude; 2) firm B believes firm C will interpret it as an invitation; and 3) firm C believes firm B will interpret it as an invitation. In comparison, with only one rival, it may be enough that firm A believes that firm B will interpret the price rise as an invitation to collude (in order for firm A to raise price) and for firm B to interpret it that way (for firm B to match the price increase). Thus, a merger that reduces the number of strategic-minded firms down to two (there could still be a competitive fringe) could substantially reduce the amount of mutual understanding needed to generate coordinated effects.

Consistent with this discussion, Shapiro (2010) mentioned two recent cases in which coordinated effects through PAC were of particular concern to the DOJ and were challenged: the proposed mergers by World Com and Sprint and by Alcan and Pechiney. In both of them, the merger would have produced a market structure with two large firms and a collection of small firms. As the pre-merger market structure was already highly concentrated, the effect of the merger on implementation conditions may not have been that great; however, its effect on coordination conditions could have been significant.[19]

If we are to evaluate a merger for coordinated effects through its impact on mutual understanding among firms, it is essential that we understand how market conditions impact mutual understanding and how mutual understanding impacts firm behavior. This is a research avenue that I have recently pursued. The objective in Harrington

[18] See, for example, Huck, Normann, and Oechssler (2004) and Engel (2007)

[19] A recent analysis by Davies, Olczak, and Coles (2011) of European Commission merger cases concluded that the EC is concerned about collective dominance (that is, coordinated effects) only when the merger would result in two large firms with reasonably symmetric market shares.

(2012b) is to develop a theory of collusion involving informational assumptions that could plausibly be satisfied without express communication of the variety that would be a Section 1 violation. It is postulated that two essential elements of tacit collusion are: 1) a transparent mechanism for coordinating on a collusive outcome; and 2) a plausible amount of mutual understanding among firms. The coordination mechanism considered is price leadership and thus is in the spirit of PAC. In terms of mutual understanding, it is assumed to be common knowledge that: 1) each firm is rational (specifically, each acts to maximize the expected present value of its profit stream); and 2) each firm will at least match price increases (up to some maximum price) and that failure to do so results in reversion to the competitive outcome. What is conspicuously not common knowledge is leadership protocol. Which firm will lead by raising price? What price will it set? Is another firm expected to lead the next round of price hikes? In other words, there is mutual understanding among firms about the general mechanism of price leadership and price matching, but firms lack common beliefs regarding the specific sequence of prices.[20] With one additional weak assumption, it is possible to characterize the steady-state price and show that it exceeds the competitive price but falls short of the collusive price that would arise if firms had complete mutual understanding regarding their behavior.

Related to this line of analysis is recent work that seeks to quantify the incentives of a firm to take the lead on price, and how a merger may impact those incentives. Moresi et al (2011) develops an index - referred to as the Coordinated Price Pressure Index (CPPI) - which is the largest price increase that a firm would be willing to initiate and its rival would be willing to follow.[21] The change in the CPPI from a prospective merger may capture the change in the prospects for PAC. Though the CPPI is based upon the concept of PAC - which, as stated in the HMGs, presumes there is no prior understanding - the CPPI is calculated assuming the price leader expects the other firm to match its price for sure. It then presumes some common beliefs among firms which underscores the point that coordinated effects will probably require some prior mutual understanding.[22]

[20] The standard theory of collusion is based on the game-theoretic concept of equilibrium which imposes the condition that each firm's strategy is common knowledge among firms. In contrast, it is only assumed in Harrington (2012b) that it is common knowledge that a firm's strategy is a member of some collection of strategies.

[21] Also see the work of Lu and Wright (2010) which provides the collusive theory that underlies the CPPI.

[22] The presumption in Moresi et al (2012) is that failure to follow a price increase is believed to induce the price leader to rescind the most recent price increase, rather than, say, rescind all recent price increases or return to the competitive outcome or price aggressively for a period or two and try the price increase again. It is not immediately clear to me which beliefs are most compelling. In Harrington (2012b), I argue there is a salience to the competitive outcome on the grounds that, in response to some departure from coordinated behavior, firms will retreat from the reasoning upon which tacitly collusive behavior - including PAC - rests, and revert to what preceded it which is competition. That is, given the lack of mutual understanding as exemplified by a failure to follow a price increase, firms return to the most recent solution for which there was mutual understanding

Additional study of the incentives for a firm to take the lead in initiating collusion could prove valuable. Furthermore, some of this analysis can draw heavily upon the existing theory of collusion because conditions for a firm to optimally initiate collusion are, to some degree, dual to the conditions for a firm to optimally sustain collusion. For example, consider the role of firm demand elasticity. When firm demand is more elastic, implementation conditions are more stringent because the gain from undercutting the collusive price is greater (as more demand is gained) and thus the incentive to sustain collusion is weaker.[23] Similarly, a higher firm demand elasticity means coordination conditions are more stringent since the loss to a firm from raising price as a price leader is greater (as more demand is lost) and thus the incentive to initiate collusion is weaker. Further study is warranted of how market conditions impact the conditions for coordination and how those conditions relate to the conditions for implementation.

In concluding this section, let me note one other situation for which the evaluation of a merger for coordinated effects is usefully viewed through the lens of how the merger can enhance mutual understanding regarding collusion. In the HMGs, a *maverick firm* is "a firm that plays a disruptive role in the market to the benefit of consumers" (p. 3) and one example given is of "a firm that has often resisted otherwise prevailing industry norms to cooperate on price setting or other terms of competition." (p. 4) The elimination of a maverick firm through a merger is well-recognized as a basis for possible coordinated effects. Even if the pre-merger market structure satisfies the implementation conditions for sustaining supracompetitive prices, the presence of a maverick firm may prevent satisfaction of the coordination conditions. In particular, if all firms but the maverick firm understand the appeal of PAC then acquisition of the maverick firm could produce the necessary mutual understanding to collude. Indeed, that acquisition may be the coordinating device if the acquisition of the maverick firm is profitable *only if* the remaining firms were to collude in price. In other words, the act of acquiring the maverick firm may not only eliminate an impediment to collusion but also induce the remaining firms to have the expectation that they will coordinate their pricing.

4 Concluding Remarks

For firms to achieve and sustain a supracompetitive outcome, they must both *coordinate* on that outcome, and *implement* it in the sense of structuring incentives so that each firm finds it optimal to abide by that outcome. The theory of collusion iden-

which is presumed to be the competitive solution preceding this collusive episode. The argument is far from airtight but the point here is less to argue that firms should hold a particular set of beliefs and more to recognize that no single set of beliefs is so natural as to rule out alternative belief assumptions and that any assumption should be explicitly recognized and justified.

[23] More elastic firm demand may also mean a more severe punishment - which makes the implementation condition less stringent - and that can be a counter-vailing force.

tifies detection and punishment as the two linchpins to successful implementation, and an extensive body of theoretical and empirical work has identified market conditions that are conducive to effective detection and punishment. Contrary to what is suggested in the 2010 Horizontal Merger Guidelines, the relevance of "detection and punishment" is no less for parallel accommodating conduct than for the traditional mechanisms by which coordinated effects are produced. Where the 2010 Guidelines are valid and constructive is emphasizing that coordinated effects could emerge even where mutual understanding is far from the level that is associated with the concept of an agreement among firms. That is a substantive inclusion for practitioners engaging in merger analysis. It is also a useful observation for scholars because an important avenue for research is to better understand how the level of mutual understanding affects the emergence and extent of coordinated effects.

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