10 Market concentration in the antitrust analysis of horizontal mergers

Jonathan B. Baker*

I Introduction
This chapter examines the role of market concentration in the analysis of horizontal merger under the antitrust laws. Concentration is a natural aspect of horizontal merger analysis because mergers among rivals, by their nature, reduce the number of firms participating in a market, make some firms larger than before and increase concentration within the market.

The role of concentration in merger review under the antitrust laws has changed markedly over time. During the 1960s, measures of post-merger market concentration and its increase from merger were viewed as sufficient statistics for determining whether the transaction was likely to harm competition. Over the succeeding decades, however, antitrust enforcers and courts have increasingly come to undertake a more wide-ranging economic analysis of proposed mergers. Still, the contemporary legal framework for analyzing horizontal mergers assigns a leading role to market concentration, basing a presumption of harm to competition from merger on high and increasing concentration.

This chapter evaluates the extent to which modern economic analysis supports a role for concentration in the antitrust review of horizontal mergers. It examines market definition, the predicate for measuring market shares and market concentration, and the role of market shares and concentration in the analysis of the coordinated and unilateral competitive effects of merger. The central issue is when and how market shares, and market concentration statistics derived from them, form an appropriate basis for presuming harm to competition from merger.

Section II describes how concentration has been employed in the legal framework for merger analysis. Section III examines the role of market definition from an economic perspective. Section IV surveys the economic justifications for representing market concentration by the Herfindahl–Hirschman Index (HHI), a commonly-employed statistic. Section V explains the role of market concentration in the analysis of coordinated and unilateral competitive effects of merger. The final Section offers concluding thoughts about the use of market shares and market concentration as a basis for presuming harm to competition from horizontal merger.
II Market concentration in the legal framework for merger analysis
Under the primary US statute regulating mergers, Clayton Act §7, mergers are illegal if ‘the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly’. In making that predictive determination with respect to horizontal acquisitions, the courts have historically assigned a leading role to one aspect of market structure: market concentration.

Modern merger law began in 1950, when Clayton Act §7, originally enacted in 1914, was amended to address what was seen as a rising tide of economic concentration in the US economy. In *United States v. Philadelphia National Bank*, the Supreme Court responded by setting forth a jurisprudential approach to horizontal merger analysis framed around a presumption of harm to competition created by high and increasing market concentration. This presumption is often termed the *Philadelphia National Bank* presumption or the ‘structural’ presumption, because it makes an inference about harm to competition from an important aspect of market structure.

During the 1960s, the Court invoked the structural presumption to prevent mergers between firms which, by modern standards, had small market shares in markets that were not concentrated. At that time, the structural presumption could be invoked in almost all mergers among rivals and was in practice virtually conclusive, making all but the smallest horizontal mergers virtually illegal per se based on evidence related to market concentration.

The doctrinal framework for merger analysis developed during the 1960s has not been overruled, but the structural presumption has eroded substantially in practical significance since that time. The Supreme Court established that the presumption was rebuttable in *United States v. General Dynamics Corp.*, the Court’s last major substantive merger decision. The successful rebuttal in *General Dynamics* was on narrow grounds, that market concentration was measured in misleading units, in an unusual case where shares based on production differed markedly from shares based on capacity. Since *General Dynamics*, the lower courts have accepted that market shares could mislead for a wide range of reasons and have used the *General Dynamics* precedent to broaden substantially the methods by which the structural presumption can be rebutted and to make rebuttal easier.

The leading modern case, *United States v. Baker Hughes, Inc.*, a DC Circuit decision written by one future Supreme Court justice (Clarence Thomas) and joined in by another (Ruth B. Ginsburg), gives a nod to the structural presumption but does not give much practical weight to market concentration. *Baker Hughes* employed and codified the doctrinal
structure for horizontal merger analysis established in *Philadelphia National Bank*. According to *Baker Hughes*, the government (the usual plaintiff in a merger case) satisfies an initial burden of production by demonstrating that the merger ‘will lead to undue concentration in the market for a particular product in a particular geographic area’.9 That showing ‘establishes a presumption that the transaction will substantially lessen competition’ (the legal standard of the Clayton Act).10 A burden of production then shifts to the defendants, the merging firms, to offer evidence that rebuts the presumption. ‘The more compelling the [government’s] prima facie case, the more evidence the defendant must present to rebut it successfully.’11 If the defendant succeeds in its rebuttal, then the government must proffer additional evidence of anticompetitive effect. At all times the ultimate burden of persuasion remains with the government.

In practical application, though, the structural presumption was accorded little weight in *Baker Hughes*. The court described market concentration as ‘a convenient starting point for a broader inquiry into future competitiveness’, emphasized the variety of factors that defendants could rely upon to rebut the government’s prima facie case based on market concentration, and declared that ‘[t]he Supreme Court has adopted a totality-of-the-circumstances approach’ to evaluating horizontal mergers.12 Using this framework, the circuit court upheld a lower court decision declining to enjoin the acquisition of a firm with a 17.5 per cent market share by a rival with a 40.8 per cent market share. It permitted the merger to proceed notwithstanding that the transaction increased concentration substantially in a market that is highly concentrated by contemporary standards.

But the structural presumption has not disappeared. A decade later, the DC Circuit – the same court that decided *Baker Hughes* – in *Federal Trade Commission v. H.J. Heinz Co.*, reversed a district court decision denying a preliminary injunction in a merger challenge and directed the district court to enjoin the merger.13 The appeals court in *Heinz* followed the burden-shifting framework set forth in *Baker Hughes*. The court concluded that the defendants had not successfully rebutted the presumption of harm to competition created by a merger that would have combined firms with 17.4 per cent and 15.4 per cent market shares, in a market where the leading firm had a 65 per cent market share. Had the merger not been enjoined, the transaction would have created a two-firm market. The appellate panel found clear error in the district court’s factual findings that the efficiencies from merger would allow the merged firm to compete more effectively against the dominant firm, thereby removing the factual underpinning to the defendants’ central rebuttal argument. With no defense rebuttal, the structural presumption carried the day for the government.14
III The role of market definition

When courts refer to market concentration, they are concerned with the number of significant rivals and the distribution of the market shares of those firms. In order to determine market shares, it is necessary to define a market within which those shares will be measured and identify the firms that participate in that market.

A market is defined in terms of a set of products and a geographic region; accordingly, it is common to speak of the product market and the geographic market. Market definition under the enforcement agency merger guidelines turns on assessing the economic force of buyer substitution. The importance of buyer substitution to antitrust analysis is evident from the following simple model of price determination in a homogeneous product industry:

\[ L = \frac{\theta}{\epsilon} \]

In equation (10.1), \( L \) is the Lerner Index of price-cost margin (price less marginal cost, as a fraction of price), \( \epsilon \) is the elasticity of market demand (defined as a positive number), and \( \theta \) indexes oligopoly behavior. With perfect competition (price-taking), price equals marginal cost, so \( \theta = 0 \). If the industry behaves like a monopolist, choosing the joint profit-maximizing price, then the Lerner Index equals the inverse elasticity of market demand, so \( \epsilon = 1 \). Other forms of oligopoly interaction would generally be expected to lead to price to fall between the competitive and monopoly levels, so \( 0 \leq \epsilon \leq 1 \).

Equation (10.1) shows why buyer substitution (here summarized as the elasticity of demand) plays a critical role in determining whether firms can exercise market power. If market demand is highly elastic, it is immediately evident that the industry would not be a valuable monopoly – making antitrust enforcement unnecessary – regardless of how successful the firms are in achieving a price close to the joint profit-maximizing level (that is, regardless of how closely \( \epsilon \) approaches one).

The antitrust analysis of horizontal mergers effectively separates the determination of \( \epsilon \) from the analysis of how the merger would alter \( \theta \). The task of market definition is to identify a set of products and regions that would be a valuable monopoly, not undermined by buyer substitution of outside goods and services or locations. When markets are defined for merger analysis, the focus is entirely on buyer substitution. Later steps in merger review – the analyses of market concentration, competitive effects, entry and efficiencies – ask whether the merger would likely lead to higher prices by altering the oligopoly interaction (whether the merger would increase \( \theta \)).
IV Measuring market concentration

Once a market is defined, the market participants are identified\(^{17}\) and market shares are assigned.\(^{18}\) During the 1960s and 1970s, the most commonly-employed summary statistic was the combined market share of the top four firms (often written $C_4$). This statistic has been replaced in common practice by the Herfindahl–Hirschman Index (HHI), defined as the sum of the squares of the market shares of the market participants.\(^{19}\) (If the market shares are measured as fractions, then the HHI will lie between 0 and 1. In antitrust practice, market shares are routinely expressed as percentages (e.g., recorded as 20 rather than as 0.20), so the HHI lies between 0 and 1,000,000.)

One traditional economic justification for using the HHI as a concentration measure views it as a measure of cartel stability.\(^{20}\) Another relates it to the price elevation in static non-cooperative oligopoly models.\(^{21}\) Neither of these justifications for relying on market concentration to infer competitive effects of merger ties competitive effects tightly to market concentration, however. This is not surprising, because, as will be discussed below in connection with the analysis of competitive effects of merger, a wide range of factors beyond market concentration also affect price determination in oligopoly.\(^{22}\)

The empirical literature relating market structure and market power provides additional support for the concern in merger analysis with high and increasing market concentration.\(^{23}\) That literature finds that increases in concentration, particularly substantial ones, may generate large increases in price — though price increases are not inevitable in concentrated markets and many factors other than concentration are also important in determining price and the competitive effects of merger.\(^{24}\) The empirical literature does not provide a strong basis for choosing any particular measure of market concentration, though it is not inconsistent with the common modern antitrust practice of using the HHI to represent concentration.\(^{25}\)

V Competitive effects

Contemporary horizontal merger analysis sharply distinguishes the possibility of coordinated competitive effects of merger from unilateral competitive effects. As will be seen, market shares and market concentration matter in those distinct analyses in different ways. Concentration can be informative with respect to each type of competitive effects analysis, though in each case, with the right information, competitive effects can also be understood without reference to shares and concentration.

A Coordinated competitive effects

Coordinated effects may arise through formal or informal cooperation by firms to reduce industry output and raise price. They include cartels, but
they also include arrangements that would not count as agreements under Sherman Act §1. The analysis of coordinated competitive effects addresses two issues: whether the market is conducive to coordination, and whether the merger matters.

The first issue, whether the market is conducive to coordination, turns on whether the firms participating in the market can solve their ‘cartel problems’: reaching a consensus on the terms of coordination, deterring members from cheating on that consensus, and preventing new competition (either expansion by excluded rivals or new entries). Notwithstanding these cartel problems, coordination can and at times does succeed. Price-fixing conspiracies are regularly uncovered by antitrust enforcers, and they sometimes involve large, sophisticated firms. Moreover, empirical economic research has identified coordinated conduct in some concentrated industries and, as explained below, economic models of repeated oligopoly interaction show that higher-than-competitive coordinated pricing is often plausible even absent an express agreement on price.

Much as merger analysis examines buyer substitution separately, by devoting the market definition step to the exclusive consideration of this economic issue, it focuses on rivalry separately from entry. Accordingly, the competitive effects discussion below will address the two cartel problems that relate to rivalry among market participants – reaching consensus and deterring cheating – but not the third, entry by new competitors.26

Coordinating firms must reach a consensus on the terms of coordination – for example, what price each will charge or what output it will produce – without engaging in the kind of negotiations that create an unlawful agreement. Reaching consensus on the terms of coordination could be a challenge even if firms are symmetric, because each would prefer to engineer a lower industry output and higher industry price mainly through output reduction by its rivals. One way firms might solve the problem of reaching consensus is by making some coordinated outcome ‘focal’ (simple and obvious, or self-evident). For example, a particular coordinated price could be selected through leader-follower behavior, or a market division based on geography or historical customer relationships might be focal.

Coordination is not inevitable even if it would be profitable for all firms and the firms can identify consensus terms of coordination, because individual firms may have an incentive to cheat on those terms. They may find it more profitable to reduce price below what the terms of coordination would require if in doing so they can expand output sufficiently. To deter such conduct, a successful cartel must find a way to detect cheating rapidly and commit to punishing the cheater (perhaps merely by returning to the competitive price).

A range of familiar market features are generally thought to affect
whether firms can be expected to reach consensus and deter cheating – and thus whether the market is conducive to coordination (putting aside entry issues). Product heterogeneity and complex, changing products are both thought likely to frustrate coordination by making it difficult for firms to reach terms of coordination, though these difficulties are not invariably insurmountable. Features that allow a firm to expand output rapidly – perhaps a firm’s own excess capacity, or vertical integration – may make cheating easy and, in consequence, frustrate coordination. Features that lead cheating firms to expect that a severe price war would result from the breakdown of a coordinated arrangement will discourage cheating, thereby facilitating coordination. These features might include excess capacity in the hands of a firm’s rivals, inelastic market demand, or low marginal costs relative to market prices. Features of the market that allow firms to cheat by making extensive sales without detection facilitate coordination. These may include private or confidential transactions, or ‘lumpy’ sales and large buyers. They may also include unpredictable market demand, which might make it difficult for a firm experiencing a sales drought to learn that the explanation is a rival’s cheating rather than a random slowdown in business.

Market concentration is also thought to help firms solve their cartel problems. With fewer firms it may be easier for firms to reach consensus on terms of coordination, in much the same way that it is easier to coordinate calendars and schedule a dinner party the fewer the people involved. It may also be easier for firms to notice rapidly that a rival is cheating when only a few firms participate in the market. The traditional rationale for challenging a merger as likely to facilitate coordination builds on this view: a reduction in the number of firms through merger, particularly when the transaction involves sizeable firms, increases the odds of industry coordination. This explanation is not entirely satisfactory because it is more of a statistical prediction than an appeal to a mechanism that would show why the merger matters. For example, it does not provide a basis for saying one possible merger in an industry presents more of a competitive threat than another, other than by reference to the size of the firms involved.

Industry coordination is understood among economists today as the product of a repeated oligopoly interaction, and is most often modeled as an infinitely-repeated oligopoly supergame (or to the same effect, as a finitely repeated interaction with uncertain termination). This approach promises to offer a richer understanding of how coordination works and why a merger might matter, as suggested by the simple model set forth below.

The central idea of the theoretical models is that successful coordination
Market concentration

requires each firm participating in the market to prefer coordination to cheating. Suppose that coordinating firms reach consensus on the industry price $P$ and on the market shares for each firm, denoted $s_i$ for firm $i$.

For example, the industry price might be determined through leader-follower behavior, by which the leader makes a particular price focal, and the market shares might be determined through some other focal rule, such as preservation of the shares or customer relationships previously obtained.

Industry output is $Q(P)$ each period, with $Q'(P) < 0$, so firm $i$ sells the quantity $s_i Q$ each period. Suppose further that firms have constant marginal costs, which may differ across firms, and face capacity constraints, which again may differ across firms. Let firm $i$ have marginal cost $c_i$ and production capacity per period of $k_i$. Assume $k_i \leq Q^*$, where $Q^*(P^*)$ is the industry output that would be produced were the industry to choose the joint profit-maximizing (monopoly) price $P^*$. Let $\delta$ represent the discount factor, which all firms share, with $0 < \delta < 1$. Assume further that if a firm chooses to cheat on a coordinated arrangement, it cuts price to just under the cartel price (so the industry price remains effectively $P$) and in doing so is able to attract so much business as to sell to its full capacity for $T$ periods. If the industry price does not change, aggregate industry output $Q$ remains unchanged as well; the cheating firm steals business from its rivals without expanding the market.

With this setup, firm $i$ earns profits from coordination of $(P - c_i)s_i Q$ each period, and the discounted present value of its stream of profits from coordination equals $\{(P - c_i)s_i Q]/(1-\delta)$. If instead the firm cheats, it earns profits $\{(P - c_i)k_i]/T$ for each of $T$ periods, and none thereafter (as the coordinated arrangement breaks down permanently once rivals detect cheating and react), creating a stream of total profits after cheating with a discounted present value of $\{(P - c_i)k_i]/T]/(1-\delta T)/(1-\delta)$. Accordingly, each firm will choose to participate in the coordinated arrangement rather than cheat so long as $\{(P - c_i)s_i Q]/(1-\delta) \geq \{(P - c_i)k_i]/T]/(1-\delta T)/(1-\delta)$. With $(1-\delta) > 0$, this incentive constraint simplifies to:

$$s_i Q(P)/k_i T \geq (1 - \delta T)$$

The numerator of the left hand expression in equation (10.2), $s_i Q(P)$, represents the firm’s output in any period at the coordinated price $P$. The denominator of the same expression, $k_i T$, represents the total output that a firm would produce by cheating before its cheating is detected and its rivals respond by lowering price. Accordingly, the left hand expression in equation (10.2) is the ratio of the firm’s single period output, if coordination succeeds, to the firm’s total output while cheating. The right hand expression, $(1 - \delta T)$, approaches zero when the discount factor approaches one.
for any positive $T$. Both sides of the equation are positive numbers. If the left hand ratio is low enough (for a given value of $(1 - \delta^T)$, then the firm will prefer cheating to continued coordination, and a coordinated arrangement will break down or fail to form in the first place. The ratio on the left hand side falls as the coordinated price $P$ rises.

The numerator of the ratio on the left hand side of equation (10.2), output in any period during which coordination succeeds, reflects the benefit the firm obtains from continued cooperation. A firm with a larger output has more to gain from coordinated pricing than a firm that sells less. The denominator of the ratio, the output that a firm would produce by cheating while its rivals attempt to cooperate, reflects the firm’s ability to expand output before its rivals catch on and cut price. Thus, a firm is more likely to prefer cheating to continued coordination as its benefit from coordination declines and its ability to profit by cheating rises.

Equation (10.2) makes the familiar ‘folk theorem’ point that coordination will arise if every firm cares enough about the future to be deterred from cheating today by the threat of future punishment. That is, if the discount factor $\delta$ is large enough, the right hand side of equation (10.2) can be made arbitrarily small, so equation (10.2) will be satisfied for all firms. Moreover, if equation (10.2) is satisfied for all firms, so that coordination succeeds, it is likely that coordination could be stable at a range of coordinated prices; this is another common ‘folk theorem’ result. Moreover, if cheating can occur for a sufficiently long time without detection and punishment (that is, if $T$ is large enough), then equation (10.2) will not hold, so no firm would find it more profitable to cooperate than to cheat.

In order to understand the implications of equation (10.2) for analysis of the coordinated effects of merger, it is useful to think of the firms participating in a market arrayed in terms of their value of $s_i Q(P)/k_i T$. The firm with the lowest value of the $s_i Q(P)/k_i T$ term is hardest to convince to join the coordinated arrangement, as it benefits least from coordination relative to its ability to profit by cheating. Suppose further that all firms would find coordination more profitable than cheating for at least a small increase in price above the level that prevailed absent coordination, and picture the firms raising the coordinated price a little at a time (perhaps through leader-follower behavior). As price rises, the left hand side of equation (10.2) declines for all firms. At some coordinated price, perhaps one below the monopoly price $P^*$, the incentives facing the firm with the lowest value of the $s_i Q(P)/k_i T$ term will switch. Equation (10.2) will no longer be satisfied for that firm, so the firm will prefer to cheat rather than to cooperate. Under such circumstances, coordination is no longer feasible for the industry. To forestall this outcome, the firms participating in the market would be expected to stop raising price just short of the level
that would induce cheating rather than cooperation from the firm with the lowest value of \( s_i Q(P)/k_i T \). Doing so would preserve coordination, but the coordinating firms would not achieve the joint profit-maximizing outcome.

As this model suggests, coordination in general can be expected to be imperfect and incomplete.\(^{35}\) Coordinating firms have an incentive to choose terms of coordination (here the coordinated price \( P \)) that increase joint profits – but to stop making coordination more effective at the point where doing so would drive a firm to cheat.\(^{36}\) In the resulting coordinated equilibrium, one firm would find itself close to indifferent between cooperation and cheating, while the other market participants would find equation (10.2) readily satisfied, not a close call. The firm that is nearly indifferent between continued coordination and cheating is termed in antitrust parlance the industry ‘maverick’.\(^{37}\) It limits the success of coordination, preventing price from reaching the monopoly level. The industry price is the maximum price at which the maverick would find cooperation profitable, not the higher industry price the other firms would select if their views controlled. In order for the market participants to coordinate more effectively – raise price further – the maverick’s incentives must change so that the constraint it imposes is relaxed. One way that could happen is through merger.

Maverick firms play an important role in merger analysis, because a merger can alter the incentives of the maverick, reducing the constraint imposed by the maverick, and thereby allow the coordinating firms to raise price closer to the monopoly level. The most direct way for a merger to do so is through an acquisition involving a maverick.

To see why, suppose firm 1 is the maverick, nearly indifferent between cooperation and cheating. Then, using equation (10.2), \( s_1 Q(P)/k_1 T = (1 - \delta^T) \). Suppose firm 1 merges with another firm, firm 2, which is not indifferent but prefers coordination, so \( s_2 Q(P)/k_2 T > (1 - \delta^T) \). The merged firm’s market share in the coordinated consensus is assumed to equal the sum of the two firms’ premerger shares, and its production capacity is the sum of the capacities of each. Then the merged firm is not indifferent, but prefers coordination to cheating – that is, that \( (s_1 + s_2) Q(P)/(k_1 + k_2) T > (1 - \delta^T) \).\(^{38}\) In short, if the firms in the industry are coordinating pre-merger and there is just one maverick, a merger involving the maverick will relax the constraint on more effective coordination, allowing the coordinating firms to raise price. Price will rise until some firm becomes indifferent between coordination and cheating. The new maverick could be the merged firm, or it could be some other firm, perhaps the one that was second most likely to cheat before the merger.

In this simple example, a merger involving non-mavericks will not affect
the constraint that the maverick, firm 1, imposes on coordination. Only a merger among mavericks will relax the constraint, make coordination more effective, and lead to a higher coordinated price. This result highlights the particular danger of coordinated competitive effects that arises when mergers involve mavericks. An acquisition involving a maverick will most likely relax a constraint on coordination, leading to higher prices.39

Within this framework, horizontal mergers affect the likelihood and effectiveness of coordination by altering the constraints imposed by maverick producers. The straightforward story set forth above does not exhaust the ways that a merger could alter the constraint on coordination imposed by the maverick, however.40 Stepping outside the model, an acquisition involving a non-maverick may have a variety of effects on competition. First, a merger of non-mavericks could alter the incentives of the industry maverick.41 For example, if the merger means that the punishment facing a cheating maverick would become more severe, the maverick might be induced to accept a higher industry price without cheating.42 But the merger of non-mavericks could instead lead the maverick to balk at charging the pre-merger price, and instead cause price to fall.43 Second, a merger among non-mavericks could, by virtue of its efficiencies, create a new maverick firm that would prefer a lower coordinated price than before. Third, a merger involving non-mavericks could lead to higher prices by facilitating exclusion of the maverick.

Notwithstanding this range of alternatives, it is appropriate for antitrust analysis of coordinated effects to emphasize the concern arising from a merger involving a maverick. As the model above suggests, a merger involving a maverick will most likely harm competition by making coordination more effective. Accordingly, Carl Shapiro and I have proposed that if the market is conducive to coordination, then proof that an acquisition involves a likely maverick should be a sufficient basis to presume harm to competition from coordinated effects.44

As a practical matter, it will not always be possible to identify the effect of the merger on the constraint imposed by the maverick in a market conducive to coordination. Under such circumstances, greater concentration raises the odds that any particular merger involves a maverick. For this reason, Shapiro and I have also proposed that if the market is conducive to coordination and the likely maverick cannot reliably be identified, then high market concentration should raise a presumption that the merger involves a maverick, and, consequently, that the merger would lead to adverse coordinated effects.45 Such a presumption would plausibly kick in at lower concentration levels if the merger narrows asymmetries among the sellers, as by reducing the differences among sellers in product attributes or seller costs or increasing the extent of multimarket contact among firms.46
Greater symmetry among sellers would tend to reduce the odds that a maverick firm would prefer a substantially lower coordinated price than its rivals, and thus tend to lead to higher prices by making coordination more effective.

**B Unilateral competitive effects**

Unilateral competitive effects of mergers arise from the loss of direct competition between the merging firms, without requiring a change in behavior by non-merging rivals. They most commonly appear in markets where firms sell differentiated products, and this industry setting will be presumed in the discussion below.47

Consider a differentiated product industry in which each firm sells only one product. In the pre-merger setting, firm 1 charges price $P_1$ and sells $Q_1$ units. Before the merger, firm 1 recognizes that if it raises its price by a small amount, $\Delta P_1$, it will lose $\Delta Q_1$ in sales (where $\Delta Q_1$ is defined as a positive number). The gains from doing so equal $\Delta P_1(Q_1)$, while the losses equal $(P_1 - C_1)\Delta Q_1$, where $C_1$ equals marginal cost and $P_1 - C_1$ represents the price-cost margin the firm would have earned on the lost sales. The firm raises price to the point where the gains from a further price increase just equal the losses, that is to where $\Delta P_1(Q_1) = (P_1 - C_1)\Delta Q_1$. After dividing both sides by $P_1$ and rearranging terms, this equation can be rewritten as $(P_1 - C_1)/P_1 = (\Delta P_1/\Delta Q_1)(Q_1/P_1)$. This latter equation can be written in the form $L_1 = 1/\eta_1$, where $L_1$ is the firm’s Lerner Index of price-cost margin $((P_1 - C_1)/P_1)$ and $\eta_1$ is (the absolute value of) the elasticity of the residual demand facing the firm $((\Delta P_1/\Delta Q_1)(Q_1/P_1))$.49 This equation is the first order condition for profit maximization by firm 1.

When the first firm raises price, it loses sales as some buyers switch to their second choice product (which could be no product at all, but instead a decision not to purchase from any seller). Some of those buyers may switch to the product sold by a second firm. Now suppose the first firm and the second firm agree to merge. The result is to change the merged firm’s profit-maximization calculus with respect to the first product (the product formerly sold by the first firm). After the merger the direct gains from raising the price of the first product continue to equal $\Delta P_1(Q_1)$. But the net losses from raising price are no longer equal to $(P_1 - C_1)\Delta Q_1$. The reason is that some of the $\Delta Q_1$ lost sales from the first product lead to increased purchases of the second product, allowing the merged firm to recapture some of the lost profits from raising the price of the first product in the form of increased profits on the price of the second product.50 The increased profits on the second product can be represented as $(P_2 - C_2)\Delta Q_2$, with $0 < \Delta Q_2 \leq \Delta Q_1$.51 Now the merged firm’s profits from raising
the price of the first product to a small amount above the pre-merger price are unambiguously positive, as \( \Delta P_1(Q_1) + (P_2 - C_2)\Delta Q_2 > (P_1 - C_1)\Delta Q_1 \).\(^{52}\)

Before the merger, the first firm declined to raise price further because the gains from doing so were not more than the losses. After the merger, the new firm recognizes that it can recapture some of those losses, so now finds it profitable to raise the price of the first product.\(^{53}\)

This is not the end of the story for the merged firm, as it may also have an incentive to increase the price of the second product. The higher price for the second product may lead some of the \( \Delta Q_1 \) customers who switched from the first product to the second to stick instead with the first product (increasing the profits from raising the price of the first product), or switch to a third alternative (reducing the profits from raising the price of the first product). The merged firm will choose a profit-maximizing price for both products simultaneously, taking a range of direct effects and feedbacks like these into account.\(^{54}\) It will also consider price and ‘repositioning’ responses by third firms.\(^{55}\) But one central idea underlying unilateral effects is captured in the example: a merger allows the firm to recapture some of the profits that would previously have been lost as a result of competition with its merger partner, removing a constraint on pricing and leading to higher prices.

A complementary way to understand unilateral competitive effects is to recognize that before the merger, competition from all firm 1’s rivals, including competition from firm 2, contributed to determining \( h_1 \), the elasticity of the residual demand function facing firm 1. The more aggressive firm 2’s competitive response to firm 1 pre-merger – the less willing firm 2 was to match firm 1’s price increase or the more that firm 2 would expand output when firm 1’s output contracted – the greater firm 1’s loss of sales to firm 2 if firm 1 raised price pre-merger, so the more elastic firm 1’s pre-merger residual demand. By merging with firm 2, however, firm 1 removed the competitive response of product 2 to a price increase on product 1.\(^{56}\) In consequence, the residual demand for product 1 will become less elastic, making it profitable for the merged firm to increase the first product’s price.\(^{57}\)

These two complementary ways of understanding unilateral effects – that they allow the firm to recapture previously lost profits, and that they remove the competitive response of an important rival – share the idea that the merger leads to higher prices by lessening a prior competitive constraint. Nothing in either way of understanding unilateral competitive effects obviously or necessarily requires market definition or relates the magnitude of unilateral effects to market concentration.\(^{58}\)

The reason is simple. In differentiated product markets, a firm’s market share reflects the fraction of potential customers who select its product.
as their first choice. But the constraint imposed by any particular rival depends instead on the firm’s customers’ second choices – in particular, on the extent to which its merger partner’s product is the second choice for those of its customers who would switch rather than stay loyal were the first firm to raise price. Thus, market shares are informative as to likely unilateral effects to the extent that customer second choices are distributed similarly to customer first choices.\textsuperscript{59}

To see how concentration might matter in unilateral effects analysis, it is useful to employ a model developed by Carl Shapiro.\textsuperscript{60} Suppose that before merger, two firms each sell a single differentiated product, that demand is linear and that the oligopoly interaction is Bertrand. Product units are defined such that the slope of each demand curve is $-1$, so the demand function for product 1, for example, is written $x_1 = A_1 - p_1 + \alpha_{21} p_2$. Here $x$ represents quantity sold and $p$ represents price, with subscripts indicating firm. The parameter $\alpha_{21}$ is the diversion ratio from product 2 to product 1.\textsuperscript{61} It represents the fraction of sales lost by firm 2 when it raises the price of product 2 that are captured by product 1. Firm 1’s marginal cost is denoted $c_1$.

Using this framework, Shapiro derives, among other things, a simple lower bound approximation formula to characterize the effect of a merger between firm 1 and firm 2 on the price of product 2.\textsuperscript{62} Varying Shapiro’s notation slightly, let $L^*_{2} = [p^*_2 - p_2]/p_2$ represent the monopolist’s price markup for product 2 over the pre-merger price, and let $L_{1} = (p_1 - c_1)/p_1$ measure the markup for the pre-merger price of product 1 over firm 1’s marginal cost.\textsuperscript{63} Then, Shapiro shows, $L^*_{2} \approx [\alpha_{21}/2][p_1/p_2]L_{1}$. This approximation formula implements the ‘recapture of lost profits’ perspective on unilateral effects, as it relates the post-merger markup for product 2 to the product of the diversion ratio (a measure of the fraction of sales recaptured through merger) and the pre-merger markup on product 1 (a measure of the magnitude of the additional profit on each recaptured sale). It is an underestimate because it ignores feedbacks that arise when the merged firm also alters the price of product 1.

Market concentration matters in this analysis if diversion ratios are related to market shares. In particular, suppose that when the price of product 2 increases, product 1 captures the fraction $s_1/(1 - s_2)$ of the sales lost by product 2. Then $\alpha_{21} = s_1/(1 - s_2)$. This representation is consistent with the idea that the second choices of the customers who switch from product 2 are distributed the same way as the first choices.\textsuperscript{64} With this assumption, the approximation formula for the post-merger increase in the price of product 2 becomes:

\[
L^*_{2} \approx [1/2][s_1/(1 - s_2)][p_1/p_2]L_{1}
\]  
(10.3)
Equation (10.3) relates the price elevation resulting to merger to pre-merger market concentration. For example, if there are five identical firms pre-merger (each with 20 per cent of the market) and if each has a pre-merger Lerner Index of 40 per cent, then the estimated post-merger markup would be 5 per cent.\(^{65}\)

Equation (10.3) shows that high concentration generally raises a serious threat of unilateral competitive effects. For example, equation (10.3) implies that in a differentiated product industry in which all firms price at about the same level and have 40 per cent margins, a merger between a firm with 50 per cent of the market and a firm with 20 per cent of the market would lead to an increase in the price (that is, a value of \(L^*\)) of about 8 per cent for one product and 12.5 per cent for the other. The products would have to be in very different market segments, appealing to different groups of customers, in order to make it plausible that a substantial number of customers switching away from their first-choice product would not shift to the merger partner’s product and that the price effects of merger would be much smaller than is suggested by application of equation (10.3).\(^{66}\) Put differently, errors in measuring the diversion ratios that arise from using market shares as a rough proxy for them are unlikely to be large enough to make implausible the inference that prices will rise non-trivially following this merger when market shares are so high, absent additional information showing that switchers from each merging firm would rarely prefer the product sold by the other firm.

In some cases, it may be easy to exploit this implication of high concentration for unilateral effects. When Whirlpool acquired Maytag in 2006, for example, Whirlpool accounted for about half the US market in both residential washing machines and residential dryers, while Maytag had about one-fifth of each. Those high shares, combined with the observations that both Whirlpool and Maytag had storied American brand names and both specialized in lower-end, top-loading washing machines (while new rivals from abroad specialized in high-end, front-loading machines), should have provided a reasonable basis for presuming that the merger would lead to adverse unilateral competitive effects.\(^{67}\)

Another example comes from the Federal Trade Commission’s (FTC) investigation of General Electric’s proposed acquisition of AgfaNDT in 2003. In the US, both firms supplied ultrasonic non-destructive testing (NDT) equipment, used by quality control and safety engineers to inspect materials without damaging them. The FTC reported that in each of three markets:

- the merging parties were the two largest firms, and the combined firm would have had a market share of greater than 70% in each of the markets. Documents
and testimonial evidence indicated that the rivalry between GE and Agfa was particularly close, and that, for a wide variety of industry participants, the products of the two firms were their first and second choices.\textsuperscript{68}

Equation (10.3) suggests, based on market concentration alone, that the GE/Agfa merger would have led to substantial price elevation in one or both firm’s products, unless the firms were distant rivals serving different groups of customers (thus calling into question the likelihood that the products of the two firms were first and second choices for a substantial group of customers).\textsuperscript{69} Additional information cited by the FTC, from documents and testimony, made it clear to the agency that this implication of the market shares was not misleading. The Commission obtained a consent order requiring divestiture of GE’s NDT business.

If market concentration is lower, more information about the distribution of customer second choices would be required before inferring diversion ratios and potentially identifying harm to competition from merger based on market shares. Suppose, for example, that the merging firms each have market shares of 10 per cent, pre-merger margins are 40 per cent for each, and the pre-merger prices of each are similar. Equation (10.3) would imply a post-merger price increase slightly more than 2 per cent for each. Now there would be more concern about the possibility of errors in measuring the diversion ratios that arise from using market shares as a rough proxy for them, and thus more concern about whether the inference that prices will rise non-trivially following the merger could be mistaken. Accordingly, the lower the merging firms’ market shares, the greater the need to analyze additional information about diversion ratios before inferring harm to competition from merger and the weaker the presumption of harm to competition from unilateral effects based on market shares. Uncertainty about the market definition could similarly weaken the presumption of harm to competition from high merging firm shares in a unilateral effects case.\textsuperscript{70}

If the available information permits informed and reasonably precise estimates of diversion ratios or the change in residual demand elasticities resulting from merger, then presumptions of harm to competition can be based on this information, without need for defining markets or measuring concentration.\textsuperscript{71} Under such circumstances, there would be no need to define markets in order to determine the likely unilateral competitive effects of merger.\textsuperscript{72} Alternatively, presumptions of harm to competition in unilateral effects cases can reasonably be based on market shares, through application of equation (10.3), consistent with a ‘default’ assumption that the diversion ratios between the products sold by the merging firms are proportional to their market shares, though the strength of that presumption should vary with the magnitude of the market shares.\textsuperscript{73}
VI Conclusion
Both the economic and legal literatures relating market concentration to the competitive effects of merger are framed around the question of whether market share statistics provide a good basis for presuming harm to competition from merger. The general issue is a decision theory problem of determining whether error and enforcement costs are minimized by conditioning liability (or, with a presumption, a higher probability of liability) on a limited factual showing, here related to market shares. From this perspective, it makes sense for enforcers and courts to rely upon a presumption of harm to competition based on market concentration and market shares if harm to competition from merger is correlated with concentration and shares, if shares can be observed inexpensively (relative to alternative ways of identifying competitive problems), and if it would be expensive for a firm contemplating an anticompetitive merger to manipulate market concentration and share measurements in order to avoid enforcement.74

The analysis in this chapter makes the case for a qualified use of market share statistics as a basis for presuming harm to competition from merger.75 It explains when and why market shares and market concentration provide a good signal of harm to competition from merger. When better evidence is available – in a coordinated effects case, about the identity of the maverick and the effect of merger on its behavior; and in a unilateral effects case, about diversion ratios and gross margins or the effect of the merger on each firm’s residual demand elasticity – then market concentration statistics are unlikely to contribute much. But in the many cases in which such evidence is weak or lacking, inferences from evidence on market structure may be appropriate. This evidence is not perfectly correlated with harm to competition (in part because shares and concentration relate to the underlying economic theory differently in a coordinated case from a unilateral one); shares and concentration are not always easy to measure (particularly because market definition can be difficult); and shares and concentration are not free from manipulation by the merging firms (through the contest over market definition) – but shares and concentration can nevertheless be useful in predicting adverse competitive effects of merger.

In both coordinated and unilateral effects cases, as indicated above, there is a sensible basis for inferring harm to competition from market concentration or market shares. An important challenge for antitrust law in the future – one that is both legal and economic – is to specify the deference that should be accorded to a presumption based on concentration and shares in a legal standard or jury instruction. The goal should be to allocate burdens of production and persuasion in ways that give presumptions...
based on market concentration and market shares an appropriate weight in light of the modern understanding of the role concentration can play in the analysis of the competitive effects of horizontal mergers.

Notes

* Washington College of Law, American University, Washington, DC.
1. Mergers of rivals are termed ‘horizontal’. Mergers involving sellers of complements, particularly between firms and their suppliers or distributors, are termed ‘vertical’. Mergers involving unrelated firms are termed ‘conglomerate’.
2. This chapter does not address important economic issues in horizontal merger analysis not directly related to market concentration, such as entry and efficiencies.
6. United States v. Von’s Grocery Co., 384 US 270 (1966) (the merging firms together controlled 7.5 per cent of market sales; and the largest firm in the market had an 8 per cent share); United States v. Pabst Brewing Co., 384 US 546 (1966) (in one market, the merged firm accounted for 4.49 per cent of the sales).
7. 415 US 486 (1974). During 1975, the Court issued three substantive decisions in bank merger cases, but General Dynamics is generally viewed as the last major Supreme Court decision interpreting Clayton Act §7.
9. Id. at 982.
10. Id.
11. Id. at 991.
12. Id. at 984.
16. In a more fully specified model, marginal cost might depend on output and exogenous cost-shift variables like factor prices; demand (and hence the demand elasticity) might depend on output and exogenous demand-shift variables like income; and oligopoly conduct might depend on marginal cost, demand and the exogenous variables in the model. Some theories of oligopoly, for example, suggest that oligopoly conduct may depend on market concentration or unanticipated declines in demand.
17. Under the Merger Guidelines, market participants include firms currently selling the products in the locations in the market, and also ‘uncommitted’ entrants that could do so quickly and with little sunk (unrecoverable) costs of entry. Uncommitted entrants are assigned market shares equal to the capacity they could profitably divert into the market in the event price was to rise a small amount.
18. Market shares may be measured in various units, most commonly sales revenues, sales units or production capacity. The analysis of the merger usually does not turn on the units in which market shares are measured, but General Dynamics was one such case. For further discussion of measurement units, see Gregory J. Werden, Assigning Market Shares, 70 Antitrust L.J. 67 (2002).
19. The HHI was introduced in the 1982 Department of Justice Merger Guidelines. It is
the most prominent member of a class of single-dimensional concentration indices that satisfy certain plausible mathematical properties. David Encaoua & Alexis Jacquemin, *Degree of Monopoly, Indices of Concentration and Threat of Entry*, 21 *Int’l Econ. Rev.* 87 (1980). Concentration from mergers is also sometimes described in terms of the number of significant firms participating in the market. Thus a merger in a market with four such firms might be described as reducing the number of significant rivals from four to three.

20. George Stigler, *A Theory of Oligopoly*, 72 *J. Pol. Econ.* 44 (1964). A simplified sketch of Stigler’s idea supposes that every buyer purchases one unit, industry customers arrive independently, and the probability that a customer would patronize a given firm after a cartel has formed equals the firm’s market share (a measure of its past success in attracting customers). Under the assumption that no firm is cheating, the distribution of any firm’s customer arrivals during a period can be characterized as binomial with probability equal to its market share \( s \) of the \( n \) industry customers. The expected sales for any firm equal \( ns \), and the variance of firm sales equals \( ns(1−s) \). In this framework, a firm will learn that some rival is cheating only by experiencing a surprising sales drought, basing that conclusion on statistical inference. Thus, the scope for secret cheating, and the instability of a cartel, grows larger as the variance of each firm’s sales grows. The average variance of firm sales across the industry equals \( \frac{1}{n} \sum s(1−s) = (1−\Sigma^2) = (1-\text{HHI}) \). This observation suggests that the stability of an industry cartel is inversely related to the HHI. When the HHI is high, it is difficult for firms to cheat without detection, deterring cheating and making the cartel stable.

There are a number of difficulties with the argument as presented here. For example, it does not explicitly model a firm’s decision to cheat rather than cooperate, or how a firm would respond if it believes that a rival has cheated; uncertainty about inferring \( n \) is not modeled; and it is not obvious why cartel stability would turn on the average variance in sales rather than the smallest sales variance. Contemporary theoretical models of cartel stability address some of these issues by working instead within a repeated game setting. E.g. Edward J. Green & Robert H. Porter, *Noncooperative Collusion Under Imperfect Price Information*, 52 *Econometrica* 87 (1984).

An alternative argument relating the HHI to cartel stability, not suggested by Stigler, assumes that a firm’s gains from cheating decrease as its market share rises (perhaps because it has more to lose from the cartel breaking down) and that the likelihood that its cheating would be detected by rivals rises with its market share (perhaps because rivals can more easily learn whether larger firms are cheating). Then each firm’s expected gains from cheating rise with \( s(1−s) \). Assuming that each firm’s decision to cheat is independent, then the odds that some firm will cheat would be related to \( \Sigma s(1−s) = (1−\text{HHI}) \).

21. In general, in such models, the index of oligopoly conduct \( \theta \) from equation (10.1) can be thought of as proportional to the HHI. In particular, when the firms have constant (though differing) marginal costs and reach a Cournot equilibrium, then each firm’s price-cost margin equals its market share divided by the industry demand elasticity. Accordingly, if \( L \) in equation (10.1) is understood as the average output-weighted industry margin, then, \( L = \text{HHI} / \epsilon \). Keith Cowling & Michael Waterson, *Price-Cost Margins and Market Structure*, 43 *Economica* 267 (1976). See also Robert E. Dansby & Robert D. Willig, *Industry Performance Gradient Indexes*, 69 *Am. Econ. Rev.* 249 (1979) (relating changes in aggregate surplus to the HHI in Cournot equilibrium).

22. Market concentration may be the product of prior strategic decisions by firms, such as investments in advertising, which also affect prices. See generally, John Sutton, *Sunk Costs and Market Structure* (1991). For a recent theoretical analysis suggesting that higher fixed costs lead simultaneously to higher prices and greater market concentration, while higher costs of stimulating buyer willingness to pay (endogenous sunk costs) raise concentration while reducing prices, see Nelson Sá, ‘Sunk Costs, Market Structure and Welfare: A General Equilibrium Interpretation’ (Working Paper, Nov. 29, 2007). For an empirical study highlighting the importance of accounting for the
Market concentration


23. Industry profitability is not a good measure of market power, however, and there is little basis, theoretical or empirical, for relating industry profitability to market concentration. Harold Demsetz, Two Systems of Belief About Monopoly, in INDUSTRIAL CONCENTRATION: THE NEW LEARNING (H.J. Goldschmid, H.M. Mann & J.F. Weston, eds. 1974) (theoretical critique); Richard Schmalensee, Inter-Industry Studies of Structure and Performance, in 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 976 (R. Schmalensee & R. Willig, eds. 1989) (Stylized Fact 4.5) (empirical survey).


26. Supply expansion by market participants that are not part of the coordinated arrangement would be considered as part of the analysis of competitive effects, but is not discussed further here.

27. Firms might reach consensus with heterogeneous, complex, or changing products through information exchange or the adoption of focal rules to simplify the coordination task. The latter approach might involve, for example, adopting a common set of product definitions, or, even if product definitions differ, adopting a common practice of quoting prices as discounts off book.

28. From the perspective of these models, the value of 0 from equation (10.1) that is observed in any period is a snapshot – a realization during that period of the outcome of a repeated interaction.


30. Side payments, such as payments to a high cost firm not to produce, are ruled out by assumption. In consequence, the coordinating firms may not be able to reach the joint profit-maximizing outcome.

31. The discount factor can be expressed as \( \delta = \frac{1}{1+r} \), where \( r \) is the interest rate between two periods of time.

32. The value of \( T \) is assumed identical for all firms.

33. If \( T = 1 \), then \( k_i \), which was previously defined as the firm’s production capacity, can be reinterpreted as the additional amount the firm can sell without detection if it decides to cheat.

34. As \( T \) grows large, the left hand side of equation (10.2) can be made arbitrarily small, while the right hand side approaches unity (as \( 0 < \delta < 1 \)).

35. Coordinating firms are unlikely to achieve an outcome that maximizes their joint profits for a number of reasons, some of which are not captured by the model. First, they may not be able to punish cheating as strongly as would be necessary. In addition, they may
not be able to allocate joint profits in a manner satisfactory to all because they may be unable to make side payments. Third, they may need to reduce the coordinated price below the joint profit-maximizing level or tolerate occasional price wars in order to deter cheating in an environment of uncertainty. Fourth, they may have difficulty identifying the joint profit-maximizing outcome when coordinating over multiple products or markets without communicating.

36. Cheating is rarely the cause of cartel breakups because colluding firms develop organizational methods to detect and deter it. Margaret C. Levenstein & Valerie Y. Suslow, What Determines Cartel Success? 44 J. Econ. Lit. 43, 75–9 (2006). Rather, breakups more commonly result from the desire of some members to renegotiate the terms of the coordinated outcome following unexpected shocks to demand or other forms of instability in the economic environment, or from the inability of the cartel to deter or accommodate entry. Although renegotiation is not permitted within the model set forth in the text, equation (10.2) suggests one reason why it might take place. Suppose that in the coordinated arrangement, the output shares (that is, the market shares $s_i$) are allocated in the same way as capacity shares $(k_i/Q)$; this is a possible focal rule for determining market shares. Then firms would have an incentive to expand capacity in order to be awarded a higher market share. The maverick could place itself in a particularly strong bargaining position by doing so, as a higher capacity could threaten to tip its incentives from cooperation to cheating, and thus allow the maverick to impose substantial costs on the other firms if they do not award it a higher market share.

37. See US DoJ & FTC (1992) Horizontal Merger Guidelines §2.12. In an oligopoly, the common industry setting leading to antitrust scrutiny of horizontal mergers, if firms are able to coordinate it is likely that some firm, and most likely a single firm, will find itself just willing to participate in the coordinated arrangement, nearly indifferent between cooperating and cheating. Put differently, in oligopoly markets where it is plausible that firms are coordinating imperfectly pre-merger, it is possible to imagine multiple mavericks but that is unlikely unless the maverick firms are nearly identical. Accordingly, the remainder of this discussion will presume that there is just one maverick.

38. The proof turns on showing that $(s_1 + s_2)Q(P)/(k_1 + k_2)T > s_2Q(P)/k_2T$. This is true if and only if $(s_1 + s_2)/(k_1 + k_2) > s_2/k_2$, which is equivalent to $(s_1 + s_2)k_2 > s_2(k_1 + k_2)$ or $s_1k_2 > s_2k_2$. The last equation holds if and only if $s_1/k_1 > s_2/k_2$, which is equivalent to $s_1Q(P)/k_1T > s_2Q(P)/k_2T$. The last inequality holds by virtue of the initial assumption that firm 2 prefers coordination while firm 1 is indifferent between coordination and cheating.

39. A merger involving a maverick could in theory instead benefit competition. This unusual outcome could occur if the merger generates large cost savings, so that it enhances the maverick’s incentive to keep the coordinated price low, thereby causing the industry price to decline. Such a merger would not be profitable for the merger partners unless the cost savings are very large, however.

40. These other possibilities are discussed in more detail in Baker (2002), Mavericks at 182–8. See also Kuhn, supra note 29, at §3.43.

41. This possibility raises obvious difficulties of proof.

42. Remarkably, therefore, it is possible that a merger conferring efficiencies on the merging firms could lead to higher industry prices.

43. For example, a merger of non-mavericks could lead the industry maverick to act more competitively than before if buyer responses to the merger reduce the maverick’s demand and make that demand more elastic.

44. Jonathan B. Baker & Carl Shapiro, Reinvigorating Horizontal Merger Enforcement, in HOW THE CHICAGO SCHOOL OVERSHOT THE MARK: THE EFFECT OF CONSERVATIVE ECONOMIC ANALYSIS ON U.S. ANTITRUST (Robert Pitofsky, ed. 2008). This presumption would be rebuttable, as by showing that the presumption was improperly invoked (e.g. the market was not properly defined or not conducive to coordination), that the merger would not alter the prospects for industry coordination (e.g. because the maverick would have no less incentive to constrain coordination after the merger than before),
that entry or expansion would likely undermine or counteract any harm to competition, or that efficiencies from merger would make the deal pro-competitive on balance.

45. *Id.* This presumption would be rebuttable.


48. The gains are technically \( \Delta P_1(Q_1 - Q_1^*) = \Delta P_1(Q_1) - \Delta P_1 \Delta Q_1 \), but the \( \Delta P_1 \Delta Q_1 \) term, the product of two small numbers, is second order in magnitude and can be ignored.

49. A firm’s residual demand function describes how its quantity sold responds to changes in its price, after taking into account the competitive responses of rivals. It differs from the more familiar structural demand function, which describes how a firm’s quantity sold responds to changes in its price holding constant the prices charged by rivals. For further discussion, see generally Jonathan B. Baker & Timothy F. Bresnahan, *Estimating the Residual Demand Curve Facing a Single Firm*, 6 Int’l J. Indus. Org. 283 (1988).

50. Note that firm 2’s product does not have to be the best substitute for firm 1’s product – perhaps more of the lost sales go to some third firm’s product. What matters is that a significant group of firm 1’s customers would respond to a higher price for firm 1’s product by switching to firm 2’s product. For those customers, firm 2’s product is their second choice at pre-merger prices. Accordingly, a merger between sellers of differentiated products may harm competition even when most of the customers switching away from firm 1’s product select the products of non-merging firms or do without the product entirely, and even when some third product is the second choice for more of firm 1’s customers than is the product sold by firm 2.

51. That is, the increased profits equal the price-cost margin on the second product, which could be different from the price-cost margin on the first product, times the increase in second product sales (which will be a portion of the lost sales on the first product).

52. In this representation, sources of incremental profits from a small price rise are placed on the left hand side of the equation, while sources of incremental losses are placed on the right.

53. An alternative intuition arising from the same model arises from observing that after the merger, output expansion by the first firm leads it to cannibalize some of the sales that would otherwise have gone to its merger partner. From this perspective, the merger can be thought of as lowering the marginal revenue obtained from selling the first product or, equivalently, as raising that product’s marginal cost (properly understood as incorporating an opportunity cost). Accordingly, the acquisition gives the merged firm an incentive to reduce output of the first product. The marginal cost perspective is emphasized in Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition* (2008).

54. The mathematics of the profit-maximization calculus for the merged firm are treated in, for example, Werden & Froeb, *supra* note 47 for various assumptions about the structure of buyer preferences and the interaction among sellers.
Firms may reposition products by altering their physical or non-physical attributes. Rival repositioning could counteract or deter the exercise of market power by the merged firm, so must be accounted for in a full analysis of the unilateral competitive effects of merger. For a model of repositioning, see Amit Gandhi, Luke Froeb, Steven Tschantz, & Gregory J. Werden, *Post-Merger Product Repositioning*, J. INDUS. ECON, 56 (1), 49–67.

Following the merger, firm 1 likely has an incentive to raise the price of both products. The merged firm has an incentive to raise the price of the first product because it knows that the acquisition will allow it to recapture some of the lost profits through increased sales of the second product. But it similarly has an incentive to raise the price of the second product – making the pricing response of the second product less aggressive than it would have been pre-merger.

This idea is implemented empirically in Jonathan B. Baker & Timothy F. Bresnahan, *The Gains from Merger or Collusion in Product Differentiated Industries*, 33 J. INDUS. ECON. 427 (1985). This method offers a way of approximating the post-merger incentive to raise price based on the assumption that the merged firm reduces output of both products by the same percentage. (However, it does not provide an exact solution to the merged firm’s joint profit maximization problem.) One advantage of this approach over simulation methodologies based on using margin data and diversion ratios is that it does not require knowledge of the oligopoly solution concept or reliable estimates of the level of marginal cost. (Information about oligopoly conduct is instead inferred empirically from the past reactions of the non-merging firms.) Farrell & Shapiro, supra note 53, propose a diagnostic test that identifies unilateral effects without estimating their magnitude. Their approach relies upon margin data and diversion ratios, but makes no assumption as to oligopoly conduct.


Diversion ratios are related to demand elasticities. For example, $\alpha_{21} = \left[ \frac{\epsilon_{21}(-\epsilon_{11})}{\epsilon_{21}} \right] \frac{x_2}{x_1}$, where $\epsilon_{21}$ is the cross elasticity of demand from product 2 to product 1, $\epsilon_{11}$ is the own elasticity of demand for product 1, and the $x$'s are quantities for the two products.

Shapiro also derives the equations for an exact solution of the model. The approximation formula is simpler to apply.

Note that $L_1$ is a conventionally-defined Lerner Index, with the price after markup as the denominator, while the denominator of $L^*_2$ is instead the price before markup.

The expression $(1-s_2)$ appears in the denominator because customers switching away from product 2 do not choose product 2. The assumption that $\alpha_{21} = s_2/(1-s_2)$ ignores the possibility that some customers switch out of the market altogether, making the aggregate diversion ratio (total diversion to other products in the market as a fraction of total sales lost by product 2) less than unity. If the aggregate diversion ratio is less than unity, the approach set forth here would lead to an over-estimate of the (lower bound approximation to the) post-merger price increase.

If the firms are symmetric, and diversion ratios are related to market shares as indicated in the text (e.g., $\alpha_{21} = \left[ \frac{s_2}{(1-s_2)} \right]$), then all diversion ratios reduce to $\alpha = \left[ \frac{l}{n(n-1)} \right]$, where $n$ is the number of firms pre-merger. Shapiro provides an exact formula for the
Market concentration 257

price increase resulting from merger for the symmetric linear Bertrand case: \[ L^* = \frac{1}{2} \left[ \alpha/(1 - \alpha) \right] L. \] With diversion ratios related to market shares, this reduces to \[ L^* = \frac{1}{2(n - 2)} L. \] For the example in the text, where \( n = 5 \) and \( L = 0.4 \), then \( L^* = 6.7 \) per cent, which is slightly higher than the 5 per cent figure given by the lower bound approximation used in the text.

66. The Merger Guidelines note that one way to tell whether diversion ratios are related to market shares is to analyze the information about consumers’ actual first and second product choices ‘provided by marketing surveys, information from bidding structures, or normal course of business documents from industry participants’. US DoJ & FTC (2006) Horizontal Merger Guidelines §2.211 n.22. The analysis of buyer substitution undertaken when defining the market may provide information that suggests or rules out this possibility, without need for further investigation.

67. The Department of Justice nevertheless declined to challenge this merger, citing in justification for its decision expansion by recent entrants, the presence of large wholesale buyers, and cost-savings from merger. US Department of Justice Antitrust Division Statement on the Closing of its Investigation of Whirlpool’s Acquisition of Maytag (US Department of Justice, March 29, 2006), available at http://www.usdoj.gov/atr/public/press_releases/2006/215326.pdf. For criticism of the Justice Department’s decision not to challenge the transaction, see Baker & Shapiro, supra note 44.


69. This interpretation of the FTC’s findings is plausible, although the FTC’s discussion of the case does not specify the market shares of the individual firms, their pre-merger prices, or pre-merger price-cost margins.

70. Suppose, for example, that two markets are plausible, with concentration high in the first and low in the second. Then it may be difficult to infer diversion ratios from market shares with confidence, and appropriate to examine additional evidence about buyer substitution before shifting a burden of production to defendant to rebut a presumption of harm to competition.

71. See Baker & Shapiro, supra note 44.


73. Baker & Shapiro, supra note 44. The presumption of harm to competition in unilateral effects cases would be rebuttable. If based on market shares, it might be rebutted, for example, by showing that the market was not defined properly, that the market shares were not measured correctly, or that the market shares misled as to the likelihood of unilateral effects (as by presenting evidence of diversion ratios and price-cost margins). If based on diversion ratios and price-cost margins, it could be rebutted, for example, by showing that the diversion ratio between the merging firms’ products is lower than claimed, or that the margin on the product to which sales are diverted is lower than claimed by the government. Either way, it could also be rebutted with evidence that rival repositioning, entry, or efficiencies from merger would prevent or counteract the harm to competition.


75. For a discussion of the appropriate role for concentration in the merger guidelines,

References


**Cases**


Antitrust law and economics


**Statute**