ASSESSING MARKET POWER: THE TRADEOFF BETWEEN MARKET CONCENTRATION AND MULTI-MARKET PARTICIPATION

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By

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Abstract

This analysis reveals that traditional market power measures are biased under the conditions of multi-market participation and demand interdependence. Specifically, when complementary (substitutable) demands dominate, traditional market power measures are biased upward (downward). A similar bias carries over to the evaluation of mergers. To wit, mergers that simultaneously increase market concentration and multi-market participation can result in lower prices even in the absence of merger economies. It follows that merger guidelines that place undue emphasis on market concentration can lead policymakers to block (approve) mergers that enhance (diminish) consumer welfare.

I. Introduction

The *Horizontal Merger Guidelines* of the U.S. Department of Justice place considerable weight on market concentration in measuring market power and evaluating proposed mergers. This emphasis is potentially problematic when the proposed industry restructuring entails trade-offs between market concentration and multi-market participation. The recent merger between AT&T Wireless and Cingular is a case in point. This merger, which created the largest wireless provider in the U.S., joined two firms that formerly competed with one another in some markets, but not in other markets. Hence, if this merger is to benefit consumers, the downward pricing pressure that derives from multi-market participation must dominate the upward pricing pressure that derives from increased market concentration.

The traditional emphasis on market concentration may be appropriate when evaluating mergers that do not entail multi-market participation. However, when the proposed merger has the effect of transforming individual-market providers (IMPs) into multi-market providers (MMPs), such an emphasis can produce biased measures of market power and lead policymakers to block mergers that enhance consumer welfare and vice versa. The risk of error is likely greatest in network industries, including

telecommunications and transportation.[1] The defining characteristic of these industries is that of demand complementarities—an increase in traffic flows in one direction on a network generates increased traffic flows in the reverse direction and also between other nodes on the network as illustrated in Figure 1.[2]

The fundamental question that we examine in this paper concerns the reliability of market concentration (respectively, changes in market concentration) as an indicator of market power (respectively, changes in market power). We show that traditional measures of market power are biased under the conditions of multi-market participation and demand interdependence. Moreover, mergers that increase the market share and the "footprint" of MMPs can combine with demand complementarities to exert greater pricing discipline despite higher levels of market concentration.[3] It is well-known, of course, that higher concentration may benefit consumers if it results in merger economies, a supply-side effect. It is also well-known that a merger between two firms that produce complementary products can result in lower prices, a demand-side effect. The primary objective of this paper is to recognize explicitly the trade-off between market concentration and multi-market participation and its implications for the measurement of market power and the evaluation of proposed mergers.[4]

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[1] There has been significant merger activity in the telecommunications and transportation industries in recent years. See, for example, Yochi J. Dreazen, 'FCC, Faced With Telecom Crisis, Could Let a Bell Buy WorldCom,' *The Wall Street Journal*, July 15, 2002, A1; Yochi J. Dreazen, Greg Ip and Nicholas Kulish, 'Oligopolies Are on the Rise As the Urge to Merge Grows,' *The Wall Street Journal*, February 25, 2002, A1; and Dennis L. Weisman, 'Footprints In Cyberspace: Toward A Theory of Mergers In Network Industries,' 1(4) *info* 305 (1999).

[2] This argument differs from the familiar double-marginalization rationale for vertical mergers. See, for example, Jerry A. Hausman, Gregory K. Leonard and J. Gregory Sidak, 'Does Bell Company Entry into Long-Distance Telecommunications Benefit Consumers?' 70(2) *Antitrust Law Journal* 463 (2002).

[3] The term "footprint" in this context refers to the degree to which the MMP participates in other markets.

[4] The parallels with Farrell and Shapiro are noteworthy. Welfare can rise with market concentration in the Farrell and Shapiro framework if demand is redistributed from relatively inefficient to relatively efficient firms. In this analysis, welfare can rise with market concentration if demand is redistributed from IMPs to

In the traditional Cournot model of oligopoly comprised exclusively of IMPs, an increase in market concentration leads to an unambiguous increase in market power, ceteris paribus. This price-increasing effect of higher market concentration is also present when the market includes MMPs, although in this case there is a countervailing influence that must be taken into account. This countervailing influence is a price-decreasing effect that derives from the MMPs' participation in complementary markets. The MMP takes into account, whereas the IMP does not, that a price increase in market *i* reduces demand in market *h* and vice versa.[5] Under conditions to be described, the price-decreasing effect of multi-market participation can dominate the price-increasing effect of higher market concentration.[6]

The primary findings of this analysis are three. First, traditional market power measures are biased under the conditions of multi-market participation and demand interdependence. Second, mergers that increase both market concentration and multi-market participation can be consistent with non-increasing, equilibrium prices, even in the absence of merger economies. Finally, there is a trade-off between merger economies and demand complementarities that should be accounted for in any evaluation of the merits of a proposed merger. These findings may have important implications for recent

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MMPs. This occurs because, in the case of complementary demands, the MMP takes into account, whereas the IMP does not, that a higher price in market *i* reduces demand in market *j*, where *i…j*. In the case of substitutable demands, precisely the opposite is true. Joseph Farrell and Carl Shapiro, 'Horizontal Mergers: An Equilibrium Analysis,' 80 (1) *The American Economic Review* 107 (1990).

[5] These are sometimes referred to as "network effects" or network externalities. For a comprehensive survey of the literature, see Stanley J. Liebowitz and Stephen E. Margolis, 'Network Effects', in Martin Cave, Sumit Majumdar, and Ingo Vogelsang (eds), *Handbook of Telecommunications Economics* (Amsterdam: North-Holland 2002) vol. 1, 75-96. For a discussion of network effects and their prominent role in recent high-profile court cases, see Howard J. Shelanski and J. Gregory Sidak, 'Antitrust Divestiture in Network Industries,' 68(1) *The University of Chicago Law Review* 1 (Winter 2001).

[6] In contrast, when demands are substitutable, multi-market participation serves to compound the price-increasing effect of higher market concentration.

consolidation trends,[7] particularly in network industries, and should serve to inform the design of efficient antitrust policy in the "new economy".[8]

The organization for the remainder of this paper is as follows. Section II briefly reviews the *Horizontal Merger Guidelines* of the U.S. Department of Justice, highlighting the emphasis placed on market concentration for measuring market power and evaluating proposed mergers. A review of traditional Cournot analysis and the significance of market concentration and supply-side merger efficiencies appears in Section III. Section IV contains a general Cournot analysis that accounts for multi-market participation and demand interdependence. The nature of the bias in traditional measures of market power is the subject of Section V. Section VI explores the implications of these findings for merger analysis. Section VII discusses the policy implications of these findings. Section VIII summarizes the main findings and concludes.

II. The U.S. Department of Justice Merger Guidelines

Concerns about the adverse economic effects of market concentration figure prominently in the *Horizontal Merger Guidelines* of the U.S. Department of Justice. These guidelines make allowances for mitigating factors, including ease of entry, merger economies and substitute products, but these are probably most accurately characterized as exceptions to the general rule that non-trivial increases in market concentration typically confer greater market power, at least in moderately concentrated and highly concentrated industries.

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[7] White conducted a recent analysis of aggregate concentration trends in the U.S. economy. Despite significant merger activity in selected industries, he finds no evidence of a wholesale increase in aggregate market concentration. See Lawrence J. White, 'Trends in Aggregate Concentration in the United States,' 16(4) *Journal of Economic Perspectives* 137 (2002).

[8] Richard A. Posner, 'Antitrust in the New Economy,' 68 *Antitrust Law Journal* 925 (2001).

The merger guidelines rely extensively upon the Herfindahl-Hirschman Index (HHI) of market concentration to establish the relevant benchmarks.[9] For example, the guidelines state that:

> Where the post-merger HHI exceeds 1800, it will be presumed that mergers producing an increase in the HHI of more than 100 points are likely to create or enhance market power or facilitate its exercise.[10]

Moreover, even in moderately concentrated industries, defined as industries with an HHI of between 1000 and 1800, the *Horizontal Merger Guidelines* specify that changes in the HHI of 100 points or more "potentially raise significant competitive concerns." Nonetheless, the merger guidelines appear to recognize the prospective limitations of an exclusive focus on market concentration:

> The post-merger level of market concentration and the change in concentration resulting from a merger affect the degree to which a merger raises anticompetitive concerns. However, in some situations, market share and market concentration data may either understate or overstate the likely future competitive significance of a firm or firms in the market or the impact of a merger.[11]

It is noteworthy that the interaction of multi-market participation and demand interdependence, the principal focus of this discussion, is not explicitly referenced in these guidelines as a possible mitigating factor. Moreover, whereas market power is increasing with market concentration in simple (Cournot) models of oligopoly, this

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[9] The guidelines state at §1.5 that "Unlike the four-firm concentration ratio, the HHI reflects both the distribution of the market shares of the top four firms, and the composition of the market outside the top four firms." Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, 1992 [Inclusive of April 8, 1997 Revisions]. We argue subsequently that a careful assessment of the merits of a proposed merger requires that antitrust authorities go even further—to investigate the distribution of market concentration across IMPs and MMPs, pre/post-merger.

[10] Ibid, at § 1.51.

[11] Ibid.

property need not arise in other, no less plausible, models of oligopoly behavior, such as Bertrand or Multi-Market Cournot models.

III. Traditional Cournot Analysis

In the simple Cournot model of oligopoly, there is assumed to be a single market in which each firm chooses an output level with the belief that its choice of output has no influence on the output choice of its rivals. It is straightforward to show that in the Cournot-Nash equilibrium,[12] the mark-up of price over marginal cost, a measure of market power, is given by

$$(1)\ \frac{P - c_s}{P} = \frac{s_s}{\varepsilon},$$

where s_s is the (output) market share of firm s and $\varepsilon = -(dQ/dP)\times(P/Q)$ is the own price elasticity of demand.[13] The left-hand side of (1) is the familiar Lerner Index of market power.[14] Equation (1) indicates that the mark-up of price over marginal cost for firm s is increasing with its market share, ceteris paribus. This is the basis for the claim that "market share is synonymous with market power."

The relationship in (1) must hold for each of the n firms in the market. Multiplying both sides of the expression in (1) by $s_{s,}$ summing over all n firms in the market and appealing to the definition of the HHI yields:

[12] In the Nash equilibrium of the Cournot game, each firm chooses an output level that maximizes its profit given the output choice of each of its rivals. A Nash equilibrium thus represents a simultaneously rational choice of output for each firm in the market.

[13] Stephen Martin, *Advanced Industrial Economics* (Cambridge MA: Blackwell Publishers 1993) 21.

[14] Abba P. Lerner, 'The Concept of Monopoly and the Measurement of Monopoly Power,' 1(3) *The Review of Economic Studies* (1934) 157; Dennis W. Carlton and Jeffrey M. Perloff. *Modern Industrial Organization* (Fourth Edition, Boston MA: Addison-Wesley, 2005) 283.

$$(2)\ L_T = \frac{P - \bar{c}}{P} = \frac{H}{\varepsilon},$$

where $\bar{c}$ is the (market share) weighted average industry marginal cost, H is the HHI and L_T denotes the Lerner Index derived from the traditional Cournot analysis. Equation (2) indicates that the mark-up of price over average industry marginal cost is increasing with market concentration, ceteris paribus.[15] This is a primary cause for concern with increasing market concentration.

Suppose now that all firms in the market have the same marginal cost, c, and that the price elasticity of demand, ε, is a constant. Rearranging the terms in (2) and solving for the market price yields:

$$(3)\ P = \left[\frac{\varepsilon}{\varepsilon - H}\right] \times c.$$

Equation (3) reveals that an increase in market concentration $(\Delta H > 0)$ must induce greater efficiencies $(\Delta c < 0)$ if the market price is to be non-increasing, post-merger. Notably, as discussed in the previous section, the *Horizontal Merger Guidelines* explicitly allow merger efficiencies to be used as a defense for a proposed merger.

The final question that we address in this section concerns the precise nature of the trade-off between market concentration and merger efficiencies necessary for the *non-increasing price condition* $(\Delta P \leq 0)$ to be satisfied, post-merger.[16] Taking the total

[15] See Richard Schmalensee, 'Industrial Economics: An Overview,' 98(392) *The Economic Journal* (1988) 643.

[16] Judge Bork argues that "The Sherman Act was clearly presented and debated as a consumer welfare prescription"—a view the U.S. Supreme Court affirmed in *Reiter v. Sonotone*. A consumer welfare prescription is synonymous with the non-increasing price condition, abstracting from quality considerations. Robert H. Bork, *The Antitrust Paradox* (New York: Macmillan 1978) 66; and Reiter v. Sonotone Corp. et al., No. 78-690, Supreme Court of the United States. 442 U.S. 343, 1979.

differential of (3), setting the resulting expression to be less than or equal to zero, and simplifying yields

$$(4)\ \%\Delta c \leq -\left[\frac{H}{\varepsilon - H}\right] \times \%\Delta H.$$ [17]

Equation (4) indicates that the non-increasing price condition is satisfied when each 1 percent increase in H is accompanied by a reduction in c of at least $H/(\varepsilon - H)$ percent. The following is an example.

Example 1. Let $c = 8$, $\varepsilon = 2$ and $H = 0.4$. This yields an equilibrium market price of 10 upon appeal to (3). Suppose that a merger is proposed that would increase market concentration by 10% to $H = 0.44$. Absent any change in marginal cost, price would rise to approximately 10.26. Conversely, if costs decrease to 7.8, a reduction of 2.5%, following the increase in market concentration, the market price remains unchanged as may be confirmed by (3). It follows from (4) that costs must fall by at least 2.5% in order for a 10% increase in H not to generate an increase in market price.

IV. A General Cournot Analysis

The traditional Cournot analysis in the previous section makes the strong assumption that there is only a single market and hence no scope for multi-market participation or demand interdependence. A more realistic assumption is that there are multiple markets and there is demand interdependence across markets. The purpose of this section is to discuss the key insights that follow from this more general analysis.

Suppose that there are z distinct markets, where $z \geq 1$ is a positive integer. There are n_s^i identical IMPs and n_m^i identical MMPs, where $n_s^i \geq n_m^i$. [18] The generalized mark-up rule,[19] the multi-market counterpart to (2), is given by:

[17] For an early formal analysis of the trade-off between market concentration and merger efficiencies, see Oliver Williamson, 'Economies as an Antitrust Defense: The Welfare Trade-offs,' 58 *American Economic Review* 18 (1968).

(5) $L_G^i = \frac{P^i - \bar{c}}{P^i} = \frac{H^i}{\varepsilon_{ii}} - X^i$, [20] where $X^i = \sum_{m=1}^{n_m^i} s_m^i \left(\sum_{h \neq i}^{z} \frac{s_m^h}{\varepsilon_{ih}} \frac{R^h}{R^i} \right), i, h = 1, ...z,$

$\bar{c}$ denotes the weighted-average industry marginal cost and L_G^i denotes the Lerner Index derived from the general Cournot analysis.[21] The first term on the right-hand side of (5) is identical to that in (2), where H^i is the HHI in market *i* and ε_{ii} is the own price elasticity of demand in market *i* as previously defined. The X^i term on the right-hand side of (5) is an adjustment to the simple mark-up rule to account for multi-market participation and demand interdependence. The term s_m^i is the market share of the representative MMP in market *i* so that $\sum_{m=1}^{n_m^i} s_m^i$ denotes the collective market share of the MMPs in market *i*. Similarly, s_m^h is the market share of the representative MMP in market *h*, where $h \neq i$. The term $\varepsilon_{ih} = (\partial P^h / \partial Q^i)^{-1} \times (P^h / Q^i)$ in (5) is the cross-demand elasticity.[22] In the case of complements, $\varepsilon_{ih} > 0$, [23] and in the case of substitutes, $\varepsilon_{ih} < 0$. [24] R^h and R^i denote the revenues in markets *h* and *i*, respectively.

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[18] An IMP in market *i* serves only market *i*. A MMP in market *i* serves market *i* and at least one other market *h*, $i \neq h$.

[19] See Dennis L. Weisman, 'A Generalized Pricing Rule For Multi-Market Cournot Oligopoly,' 81(1) *Economics Letters* 95 (2003).

[20] Note that X^i can exceed $\frac{H^i}{\varepsilon_{ii}}$ for some, but not all, markets *i*.

[21] Tirole derives a mark-up rule for a price-setting, multi-product monopolist with interdependent demands. This rule indicates that when the goods are complements, the multi-product monopolist sets a lower price than a single-product monopolist operating independently in each market. The complementary nature of demand forces the multi-product monopolist, but not the single-product monopolist, to account for the fact that a higher price in market *i* reduces demand in market *h*. The logic underlying this analysis is similar except that it is cast in terms of MMPs and IMPs rather than multi-product and single-product monopolists, respectively. Jean Tirole, *The Theory of Industrial Organization*, (Cambridge MA: MIT Press 1988) 70.

[22] The cross-demand elasticity measures the percentage change in (inverse) demand in market *i* with respect to a one percent change in quantity demanded in market *h*. This differs from the more familiar cross-price elasticity, which measures the percentage change in quantity demanded in market *i* with respect to a one percent change in price in market *h*.

Recognize that when there is no multi-market participation, $s_m^i = 0$ for all markets *i*, $X^i = 0$ and the generalized mark-up rule in (5) reduces to the simple mark-up rule in (2). In addition, when the products in markets *i* and *h* are independent,[25] $X^i = 0$ and the generalized mark-up rule in (5) again reduces to the simple mark-up rule in (2). In general, when complementary (substitutable) demands dominate, $X^i > (<) 0$ and traditional market power measures are biased upward (downward). We explore this bias in the following section.

V. Market Power Measurement Bias

A natural question that follows from the general mark-up rule in (5) concerns the direction and magnitude of the bias in market power measurement when there is multi-market participation and demand interdependence. The measurement of this bias is the primary objective of this section. Let the bias measure in market *i* be denoted by β^i, where

$$(6)\ \beta^i = -\frac{[L_G^i - L_T^i]}{L_G^i} = \frac{X^i \varepsilon_{ii}}{H^i - X^i \varepsilon_{ii}}$$

upon appeal to (2) and (5). Recognize that $\beta^i = 0$ when $X^i = 0,$ as expected.

The nature of this bias is illustrated in Table 1 for the indicated parameter values and *z* identical markets. A number of observations follow from this example. First, when there is a single market (*z* = 1) and/or demands are independent ($\varepsilon_{ih} \to -\infty/\infty$), there is

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[23] This case raises the possibility that a MMP may have an incentive to set price below marginal cost in selected markets. See above note 20.

[24] It is important to recognize that the degree of complementarity (substitutability) increases as the cross-demand elasticity decreases in absolute value.

[25] Under these conditions, a change in quantity in market *i* has no effect on (inverse) demand in market *h*, or $\partial P^h / \partial Q^i = 0 \Rightarrow \varepsilon_{ih} \to \infty.$

no bias in the measurement of market power and $\beta = 0$. Second, the absolute value of the bias in the measurement of market power increases with the number of distinct markets (z) and the degree of demand complementarity (substitutability). Consider, for example, the row in Table 1 corresponding to $\varepsilon_{ih} = 4$. The β values of 0.6 and 3.0, respectively, indicate that the traditional measure of market power overstates the general measure of market power by 60 percent when $z = 2$ and 300 percent when $z = 3$. Moreover, when $z = 2$, the bias increases from 60 percent for $\varepsilon_{ih} = 4$ to 100 percent for $\varepsilon_{ih} = 3$. Finally, observe the entry in the table corresponding to $z = 3$ and $\varepsilon_{ih} = 3$. Under these conditions, $L_G = 0$, indicating that multi-market participation and complementary demands combine to instill "competitive market" discipline (that is, price equal to marginal cost). This example suggests that the bias in the use of traditional market power measures can be pronounced in the presence of multi-market participation and demand interdependence.

[Table 1 About Here]

VI. Merger Analysis

Just as the failure to account for multi-market participation and demand interdependence can bias the measurement of market power, it can also lead antitrust authorities to block mergers that are welfare-enhancing and approve mergers that are welfare-diminishing. This possibility is of significant public policy concern.

A careful examination of the right-hand side of (5) reveals that the first term is positive and the second term is negative when complementary demands dominate $(X^i > 0)$. Hence, the larger the footprint of the MMPs in complementary (substitute)

markets, as measured by the term in braces in the expression for X^i, the lower (higher) the equilibrium price in market *i*, ceteris paribus. Furthermore, a necessary condition for an increase in market concentration to result in a decrease in the equilibrium price when demands are complementary is that the collective market share of the MMPs increases, post-merger. This suggests a trade-off between market concentration and multi-market participation. To examine this trade-off, we can solve (5) for the equilibrium price, P^i, which yields the following generalized pricing rule:

$$(7)\ P^i(n_s^i, n_m^i) = \left[1 - \frac{H^i}{\varepsilon_{ii}} + X^i\right]^{-1} \times \bar{c},\ i = 1,...z.$$

The non-increasing price condition is satisfied when the equilibrium price in the market that is served exclusively by n_m MMPs is no higher than the equilibrium price when the market is served exclusively by $n_m \leq n_s$ IMPs.[26] This implies, upon appeal to (7), that:

$$(8)\ P^i(n_s^i, 0) \geq P^i(0, n_m^i).$$

The following example illustrates the trade-off between market concentration and multi-market participation that satisfies the condition in (8).

Example 2. Let $\bar{c}$ = 10, $\varepsilon_{ii} = 1.5$, $\varepsilon_{ih} = 3$ and z = 2. Suppose that market *i* is initially served by 4 IMPs and 0 MMPs so that $n_s^i = 4$ and $n_m^i = 0$. This implies that $H^i = 0.25$. A merger is proposed that would result in the market being served exclusively by MMPs. It follows from (7) that $P^i(0, n_m^i) \leq P^i(4, 0) = 12$ for all $n_m^i \geq 2$. Moreover, when $n_m^i = 2$, $P^i(0, 2) = P^i(4, 0) = 12$ and $H^i = 0.5$. Hence, the HHI doubles with the proposed merger

[26] It is possible to examine this trade-off when IMPs and MMPs operate simultaneously in a given market, but this requires imposing additional structure on the demand functions. For example, Weisman derives a simple expression for the marginal rate of substitution of MMPs for IMPs that depends only on the parameters of the symmetric, linear demand functions. See Dennis L. Weisman, 'Market Concentration, Multi-Market Participation and Mergers In Network Industries,' 4(2) *The Review of Network Economics* (2005 forthcoming).

while the market price is unchanged. In contrast, traditional merger analysis applied to these data would predict a post-merger market price of 15, or a price increase of 25%. Hence, in the case of complementary demands, traditional merger analysis overstates the upward pricing pressures resulting from higher market concentration.[27]

It is straightforward to show that the degree of demand complementarity required to satisfy the non-increasing price condition is decreasing with the level of merger efficiencies, ceteris paribus.[28] This suggests a trade-off between demand complementarities and merger efficiencies. Furthermore, note that if the number of distinct markets (*z*) is "sufficiently large" and ε_{ih} is "sufficiently small," the equilibrium price will be lower in a market served by a monopoly MMP than in a relatively unconcentrated market served exclusively by IMPs. The following is an example.

Example 3. Let $\bar{c} = 10$, $\varepsilon_{ii} = 1.5$ and $\varepsilon_{ih} = 3$. Suppose that market *i* is initially served by 4 IMPs and 0 MMPs so that $n_s = 4$ and $n_m = 0$. This implies that $H^i = 0.25$ and $P^i = 12$. A proposed merger would result in the market being served exclusively by a monopoly MMP. It can be shown from (7) that $P^i(0, 1) < P^i(4, 0) = 12$ for all $z \geq 3$.[29]

VII. Policy Implications

In this section, we first summarize and then apply the principles developed in Sections 5 and 6 to the analysis of contemporary antitrust issues. We then discuss the implications of this analysis for the information that policymakers should find relevant in evaluating proposed mergers.

A. Key Principles

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[27] Alternatively, if $\varepsilon_{ih} = -3$ then $P^i(0, 2) = 20 > 15$, ceteris paribus. Hence, in the case of substitutes, traditional merger analysis understates the upward pricing pressures resulting from higher market concentration.

[28] To see this, note that if the post-merger value of $\bar{c}$ were 9 rather than 10 in *Example 2*, the non-increasing price condition would be satisfied for $\varepsilon_{ih} \leq 6$ rather than $\varepsilon_{ih} \leq 3$ when $n_m^i = 2$.

[29] The critical value of *z* is actually 2.5, but recall that *z* is constrained to take on only integer values.

1) Traditional market power measures are biased upward (downward) when complementary (substitutable) demands dominate, ceteris paribus.

2) When complementary demands dominate, multi-market participation provides a countervailing influence on the price-increasing effect of higher market concentration. Traditional merger analysis will tend to overstate the upward pricing pressures resulting from higher market concentration under these conditions. The implication is that higher market concentration, including possibly market monopolization,[30, 31] need not lead to higher prices, even in the absence of merger economies.

3) When substitutable demands dominate, multi-market participation compounds the price-increasing effect of higher market concentration. Traditional merger analysis will tend to understate the upward pricing pressures resulting from higher market concentration under these conditions. The implication is that higher market concentration will lead to higher prices unless accompanied by non-trivial merger economies.

4) The degree of demand complementarity required to satisfy the non-increasing price condition is decreasing with the level of merger efficiencies, ceteris paribus. The implication is that there is a trade-off between merger economies and demand complementarities.[32]

These principles highlight the fact that antitrust guidelines that place undue weight on market concentration can lead policymakers to over (under)-estimate market power

[30] Note that this type of market consolidation poses no difficulties for Judge Bork's definition of competition. Judge Bork argues that: "Competition," for purposes of antitrust analysis, must be understood as a term of art signifying any state of affairs in which consumer welfare cannot be increased by judicial decree. He therefore rejects the idea that "competition" is synonymous with "rivalry." See Bork, above n 16, at 58.

[31] This possibility, while perhaps intriguing, would still have to be reconciled with the specific wording contained in Section 7 of the Clayton Act which proscribes acquisitions "wherein any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or tend to create a monopoly." Clayton Act. 15 USCS § 18 (2003).

[32] For a formal derivation of this result, see Dennis L. Weisman, 'Market Concentration, Multi-Market Participation and Antitrust,' KSU Working Paper (November 2004).

and hence block (approve) mergers that are likely to enhance (diminish) consumer welfare—an outcome seemingly at odds with the goals of the antitrust laws.[33]

B. Contemporary Applications

This analysis has special relevance for mergers in network industries,[34] including telecommunications[35, 36] commercial airlines,[37, 38] and railroads.[39, 40] This is the case because an increase in traffic flows from one node to another node on a telecommunications or transportation network generates increased traffic flows in the reverse direction and to other nodes on the network as well as illustrated in Figure 1. It is significant that each of these industries is characterized by multi-market participation and

[33] For an insightful discussion of the consumer welfare standard in antitrust jurisprudence, see Jerry A. Hausman and J. Gregory Sidak, "A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks," 109 *The Yale Law Journal* (1999) 452-453. See also Hans B. Thorelli, *The Federal Antitrust Law*, (Baltimore MD: The John Hopkins Press, 1955).

[34] This is not to suggest that the applications discussed herein are necessarily restricted to network industries. Consider, for example, the possibility that consumption of a particular good in one geographic market increases the likelihood of consumption of that good in another geographic market.

[35] See Dale E. Lehman and Dennis L. Weisman. *The Telecommunications Act of 1996: The "Costs" of Managed Competition* (Boston MA: Kluwer Academic Publishers 2000).

[36] Empirical demand analysis in the telecommunications industry confirms the existence of demand complementarities in the form of point-to-point traffic patterns. See, for example, Lester D. Taylor, *Telecommunications Demand In Theory and Practice* (Boston MA: Kluwer, 1994); and Alexander C. Larson, Dale E. Lehman, and Dennis L. Weisman. 'A General Theory of Point-to-Point Long-Distance Demand', in A. de Fontenay, M.H. Shugard and D.S. Sibley (eds), *Telecommunications Demand Modelling* (North-Holland Publishing Co, Amsterdam 1990) 299-318.

[37] Steven A. Morrison and Clifford Winston, 'The Remaining Role for Government Policy in the Deregulated Airline Industry', in Sam Peltzman and Clifford Winston (eds), *Deregulation of Network Industries* (Washington D.C.: AEI-Brookings Joint Center For Regulatory Studies 2000) 1-40.

[38] These findings may have implications not only for mergers, but also for alliances between commercial airlines. For example, Brueckner and Whalen found that international alliances can reduce interline airfares without necessarily raising fares in those markets in which the alliance partners compete directly. See Jan K. Brueckner and W. Tom Whalen, 'The Price Effects of International Airline Alliances,' 43 *Journal of Law and Economics* 503 (2000).

[39] Curtis Grimm and Clifford Winston, 'Competition in the Deregulated Railroad Industry: Sources, Effects, and Policy Issues', in Sam Peltzman and Clifford Winston (eds), *Deregulation of Network Industries* (Washington D.C.: AEI-Brookings Joint Center For Regulatory Studies 2000) 41-71.

[40] Joon Je Park, Michael W. Babcock, Kenneth Lemke and Dennis L. Weisman, 'Simulating The Effects of Railroad Mergers,' 67 (4) *Southern Economic Journal* 938 (2001).

demand complementarities of the sort shown to be most damning to traditional merger analysis.[41]

With respect to the telecommunications industry, and wireless telecommunications, in particular, a number of market analysts believe this industry is poised for significant consolidation as market providers seek to expand the size of their footprint.[42] Following Cingular's recently-approved acquisition of AT&T Wireless,[43] there are now five wireless telecommunications providers in the U.S. with a "national footprint,"[44] and over one-hundred and fifty non-national providers.[45] It is anticipated that any wholesale movement to consolidate would invite antitrust scrutiny as policymakers may be concerned that higher levels of concentration will lead to higher prices.[46] The findings of this analysis suggest that the price-decreasing effect of multi-market participation may dominate the price-increasing effect of greater concentration. In other words, reducing

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[41] For a critique of the application of modern antitrust law to network industries, see George L. Priest, 'Flawed Efforts to Apply Modern Antitrust Law to Network Industries', in Robert Hahn (ed), *High Stakes Antitrust: The Last Hurrah?* (Washington D.C.: AEI-Brookings Joint Center for Regulatory Studies 2003) 117-157.

[42] Jesse Drucker and Almar Latour, 'AT&T Wireless, Cingular in Talks on Possible Deal,' *The Wall Street Journal*, January 14, 2004 (On-Line Edition).

[43] Federal Communications Commission, In the Matter of Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 04-70, October 26, 2004.

[44] These are Cingular, Nextel, Sprint PCS, T-Mobile, and Verizon Wireless. Federal Communications Commission, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Ninth Report. WT Docket No. 04-111, September 28, 2004 at ¶ 36. At the time of this writing, a merger between Sprint PCS and Nextel is pending.

[45] These carriers collectively operate 3,123 wireless systems in the U.S. and serve in excess of 180.46 million subscribers as of March 26, 2005. See CTIA at http://www.ctia.org/and CTIA (2005) and Cellular Telecommunications and Internet Association (CTIA), "Semi-Annual Wireless Industry Survey," http://www.ctia.org/public_policy/statistics/index.cfm/AID/10030 (2004).

[46] As of 2004, 276 million people, or 97 percent of the population in the U.S., live in counties in which there are 3 or more wireless providers. Approximately 250 million people, or 87 percent of the population in the U.S., live in counties in which there are 5 or more wireless providers. More than 216 million people, or 76 percent of the population in the U.S., can now choose from among 6 or more different wireless providers. Finally, 84 million people, or almost 30 percent of the population, live in counties served by 7 or more different wireless providers. See FCC, above note 44, at ¶ 49. This increasing competition has led to a pronounced reduction in prices. For example, average revenue per minute declined from $0.47 per minute in 1994 to $0.10 at the beginning of 2003, a reduction of 79 percent. See FCC, above note 44, at ¶ 171.

the number of independent providers through consolidation will allow for the internalization of demand externalities and possibly lower prices, despite reduced rivalry.

Concerns about the possible adverse effects of further consolidation among railroads recently led the Surface Transportation Board (STB) to revise its policies governing mergers and acquisitions.[47]

> Our revised rules reflect a significant change in the way in which we will apply the statutory public interest test to any major rail merger application. Because of the small number of remaining Class I railroads, . . . we believe that future merger applicants should bear a heavier burden to show that a major rail combination is consistent with the public interest. Our shift in policy places greater emphasis in the public interest assessment on enhancing competition while ensuring a stable and balanced rail transportation system.[48]
>
> However, we know from the last round of mergers that another merger involving two very large railroads would not likely be an isolated event, but instead would trigger responsive proposals that, if granted, could lead to a transcontinental railroad duopoly.[49]

The STB further noted that it "would require applicants in future merger proceedings to present proposals that enhance, not merely preserve, competition, in order to secure our approval."[50, 51] The key premise underlying the STB's revised merger policy is apparently that reduced rivalry in the industry would necessarily lead to higher prices, in part,

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[47] As a result of consolidation, the number of Class I railroads in the U.S. declined from 40 in 1980 to 12 in 1993. See Association of American Railroads, Washington D.C., 1981, at 2; 1994, p. 3. [Class I railroads are defined by operating revenue thresholds that are adjusted annually for inflation. In 2002, a class I railroad was defined as any railroad with at least $272 million in annual revenues. See Association of American Railroads, Washington D.C., 2003, at 3)] In 2003, there were only seven remaining Class I Railroads in the U.S. These are the Norfolk Southern, the Kansas City Southern, the Burlington Northern/ Santa Fe, the Canadian National, the Soo Line (owned by the Canadian Pacific), the Union Pacific and CSX Transportation. See Surface Transportation Board, Office of Economics, Environmental Analysis, and Administration, Statistics of Class I Freight Railroads in the United States for the Year Ended December 31, 2002, at 3.

[48] See Surface Transportation Board, Office of Economics, Environmental Analysis, and Administration, Statistics of Class I Freight Railroads in the United States for the Year Ended December 31, 2001, at 9.

[49] Ibid, at 43.

[50] Ibid, at 10.

[51] The STB goes on to note that whereas their previous policy statement on mergers focused on "greater economic efficiency" and "improved service" as the most likely and significant public service benefits, the new policy statement adds enhanced competition as an important public interest benefit. Ibid, at 14.

because the "efficiencies … likely to be realized from further downsizing of rail route systems are limited."[52]

The findings of this analysis suggest that further consolidation among railroads, even consolidation to a "transcontinental railroad duopoly," could potentially lead to lower prices even if such consolidation fails to yield merger economies.[53] This could occur because railroads compete in multiple complementary markets or city pairs and mergers of this type can serve to internalize demand externalities and therefore yield lower prices.

C. Policy-Relevant Information

The findings of this analysis may also serve to influence the type of information that antitrust authorities rely upon in evaluating proposed mergers. For example, it is conceivable that evidence of demand complementarities could substitute, at least in part, for evidence of merger economies. This flexibility is important given well-known problems with asymmetric information and the speculative nature of expected efficiency gains:

> Efficiencies are difficult to verify and quantify, in part because much of the information relating to efficiencies is uniquely in the possession of the merging firms. Moreover, efficiencies projected reasonably and in good faith by the merging firms may not be realized … Efficiency claims will not be considered if they are vague or speculative or otherwise cannot be verified by reasonable means.[54]

Nonetheless, it should be recognized that demand complementarities, while perhaps somewhat less speculative in nature than merger efficiencies, are potentially subject to

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[52] Surface Transportation Board Decision, SBC Ex Parte No. 582 (Sub-No.1), Major Rail Consolidation Procedures, June 11, 2001, at 14.

[53] In fact, despite significant consolidation in the railroad industry, inflation-adjusted, railroad rates have decreased by more than 45 percent since 1984. See Surface Transportation Board, above note 48, at note 11.

[54] See Department of Justice, above n 9, at § 4.

measurement problems of their own. These include limited data availability and econometric estimation of the underlying demand system.

This analysis also suggests that HHI measures alone are potentially misleading in drawing inferences about market power and the merits of proposed mergers. Hence, it may be necessary for policymakers to go beyond calculating simple measures of market concentration and investigate the distribution of market concentration across IMPs and MMPs, pre-/post-merger. This type of information will enable policymakers to make the critical distinction between reduced rivalry and reduced competition.

VIII. Summary and Conclusions

This analysis explores the trade-off between market concentration and multi-market participation when demands are interdependent. We find that traditional measures of market power are biased upward (downward) when complementary (substitutable) demand dominate. Furthermore, mergers that increase both market concentration and multi-market participation may be consistent with non-increasing, equilibrium prices even in the absence of merger economies. In the case of complementary (substitutable) demands, the larger footprint of the merging firms provides a countervailing (compounding) influence on the upward pricing pressures typically associated with greater market concentration.

A number of policy recommendations are suggested by this research. First, simple measures of market concentration should yield to a more comprehensive analysis of the distribution of market concentration across IMPs and MMPs, pre/post-merger. Second, whereas the *Horizontal Merger Guidelines* recognize supply-side merger efficiencies as a possible mitigating factor in a proposed merger, it is arguably no less important to

recognize demand-side merger efficiencies that derive from internalizing demand externalities. Finally, it is seemingly important, particularly in network industries, for antitrust authorities to distinguish between reduced rivalry and reduced competition, as it is only the latter that unambiguously reduces consumer welfare.

These findings may call into question, at least in certain industries, the emphasis that the *Horizontal Merger Guidelines* place on market concentration for measuring market power and evaluating proposed mergers. More importantly, this research may serve to inform the design of efficient antitrust policies in the new economy—an environment in which multi-market participation and demand interdependence are more likely to be the rule rather than the exception.

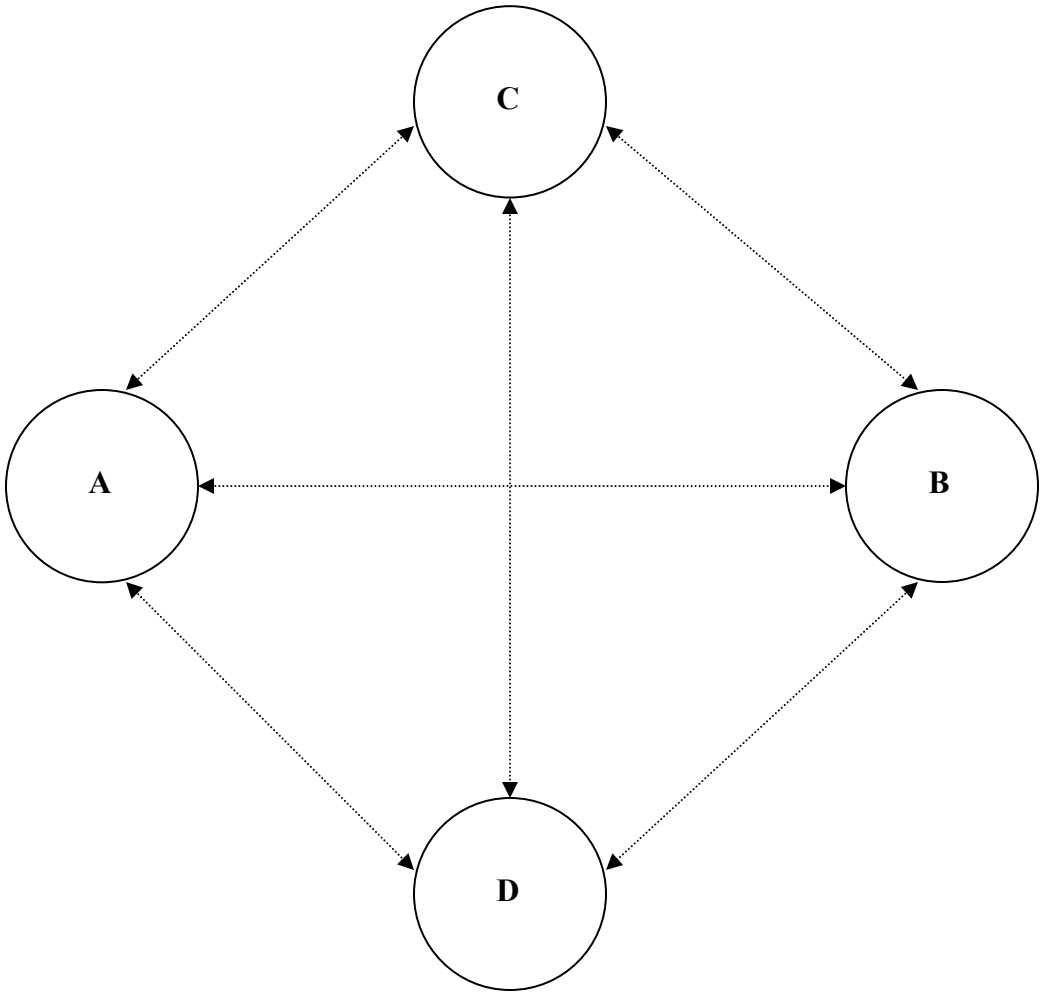

Figure 1. Network Traffic Flows

z / ε_{ih}	1			2			3		
	L_G	L_T	β	L_G	L_T	β	L_G	L_T	β
-4.0	0.1667	0.1667	0	0.2292	0.1667	-0.273	0.2917	0.1667	-0.429
-3.0	0.1667	0.1667	0	0.2500	0.1667	-0.333	0.3333	0.1667	-0.500
3.0	0.1667	0.1667	0	0.0834	0.1667	1.000	0.0000	0.1667	N.A.†
4.0	0.1667	0.1667	0	0.1042	0.1667	0.600	0.0417	0.1667	3.000
-∞/∞	0.1667	0.1667	0	0.1667	0.1667	0	0.1667	0.1667	0

†The computation of β entails division by zero which is undefined.

Table 1.

Bias in L_T Market Power Measures

Parameter Set: $\varepsilon_{ii} = 1.5, \bar{c} = 4, n_m^i = n_m^h = 4, n_s^i = n_s^h = 0.$