

# **The “Dominant Firm” Revisited: The Case of Telecommunications**

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## **Abstract**

This paper presents a framework for evaluating whether a firm is “dominant” in a particular market despite manifesting relatively “high” market shares. We show that demand complementarities and high price-cost margins combine with multi-market participation to reduce the significance of market share in drawing inferences about dominance. We further show the equivalence between this multi-market measure of market power and the critical elasticity for the “dominant” firm. These findings suggest that the use of traditional (single-market) measures of market power commonly used to infer dominance can lead policymakers to maintain regulatory oversight when market forces are sufficient to provide the requisite degree of “competitive” discipline.

## **I. Introduction**

In recent years, there has been a major shift in public policy on the nature of and prospects for competition in the telecommunications industry, especially in North America. Up until the beginning of 2004,<sup>1</sup> a prevailing view was that a major source of competition for formerly regulated monopoly incumbents would take the form of entrants providing retail services provisioned with wholesale elements obtained from the

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<sup>1</sup> Tardiff (2007) describes specific events associated with these developments.

incumbents on a mandatory basis. Subsequently, this type of competition has ebbed in importance—attributable in part to (1) the availability of wholesale inputs being scaled back, (2) competitors that formerly availed themselves of wholesale inputs having been acquired by incumbents (SBC acquiring AT&T to become the new AT&T and Verizon acquiring MCI), and (3) “intermodal” alternatives such as cable telephony, wireless, and voice over Internet protocol (VoIP) expanding markedly in volume. In spite of these developments, incumbents’ market shares for traditional local voice services have remained high by conventional standards. And yet, these “dominant” providers have contended that their retail should prices be deregulated (or at least be subject to relaxed regulation) and an increasing number of regulators have agreed.

The term dominant provider typically refers to a firm operating in a well-defined product/geographic market with a high market share and barriers to entry that confer significant market power.<sup>2,3</sup> According to Areeda and Hovenkamp (2005, p. 5-6),

Thus, the substantial market power that concerns antitrust law arises when the defendant (1) can profitably set prices well above its costs and (2) enjoys some protection against a rival’s entry or expansion that would erode such supracompetitive prices and profits.

Hence, for the purposes of our analysis, we treat market dominance and substantial market power (significant market power or SMP as it is commonly referred to in Europe) as being synonymous.

In a regulated context, dominance is generally considered necessary and sufficient for subjecting a market provider to economic regulation. That is to say, in markets that

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<sup>2</sup> Massimo (2004, pp. 34-35) observes that “dominance relates to a situation where a firm enjoys a very high degree of market power, but the jurisprudence has made it clear that a firm with 40% of the relevant market—far from being a monopolist—might well be a dominant one.”

<sup>3</sup> A firm possesses market power when it has “the ability profitably to maintain prices above competitive levels for a significant period of time.” U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines* Section 0.1 (1992).

are subject to economic regulation, a firm should be regulated if and only if that firm is dominant in that particular market. While the literature recognizes that economic regulation should serve as a surrogate for competition,<sup>4</sup> it does not provide policymakers with unambiguous guidance as to when deregulation is warranted. As Professor David Sappington has observed

It is generally preferable to replace regulatory control with the discipline of competition when competition provides adequate protection for consumers. In practice, though, it is often difficult to determine precisely when adequate, sustainable competitive pressures have developed.<sup>5</sup>

Of the three components that typically comprise market dominance—high market share, barriers to entry and significant market power—market share is perhaps the easiest to measure and hence the metric that regulators tend to focus on in drawing inferences about market dominance.<sup>6</sup> Whereas the shortcomings associated with using market share to infer market power are well known, particularly in regulated industries,<sup>7</sup> these tend not to have dissuaded regulators from relying upon such measures.

Regulators in the telecommunications industry are currently deciding upon the proper scope of regulatory oversight in the presence of competitive alternatives to traditional wireline telephone service. Whereas these competitive alternatives, including wireless and VoIP have made sizable inroads, the market shares of the incumbent providers remain high by traditional standards<sup>8</sup> and regulators may be reluctant to “let go” if there is a risk that prices will increase.<sup>9</sup>

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<sup>4</sup> Kahn (1970, Vol. 1, p. 17).

<sup>5</sup> Sappington (2002, p. 265 note 58).

<sup>6</sup> See Robinson and Weisman (2008) for a discussion of regulators’ incentives and their focus on short-run market performance.

<sup>7</sup> Landes and Posner (1981, p. 975) observe that “To the extent that regulation is effective, its effect is to sever market power from market share . . . “

<sup>8</sup> For example, incumbent providers served 82 percent of end-user switched telephone lines as of mid 2007 in the U.S. and about 85 percent of the lines in Canada as of the end of 2006. Federal Communications

In this paper, we contend that the inherent problems associated with traditional market share measures to infer dominance are exacerbated in the telecommunications industry as a result of a combination of market and technological factors, including scale/scope economies and demand complementarities.<sup>10</sup> As a result, undue reliance on traditional, single-market metrics to draw inferences about market power and dominance is likely to lead policymakers to maintain regulatory oversight when market forces are capable of providing the requisite degree of “competitive” discipline.

The primary findings of this paper are four-fold. First, drawing inferences about dominance and market power in a particular market must be informed by that provider’s multi-market participation. Second, the Lerner index for the particular market in question, a common measure of market power, is dampened by that provider’s participation in complementary markets with relatively high Lerner indexes. Third, the digitalization of the network and the provision of complementary services over a common technological platform will give rise to relatively high price-cost margins that naturally serve to constrain the exercise of market power. Finally, these market and technological trends in the telecommunications industry lead to the conclusion that a “little competition” can go a long way in constraining the market power of what by conventional measures would appear to be a dominant firm.

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Commission (2008) and Canadian Radio-television and Telecommunications Commission (2007). The US incumbent share reported by the FCC may be somewhat overstated because the FCC’s data appears to undercount the number of lines provided by cable television companies. In particular, while the FCC reports 7.7 million lines using coaxial cable as of June 30, 2007, the corresponding figure reported by the National Cable & Telecommunications Association (NCTA) is 12.1 million (increasing to 15.1 million by the end of 2007) (NCTA statistics available at <http://www.ncta.com/Statistic/Statistic/ResidentialTelephonyCustomers.aspx>). Increasing the competitors’ line count by the 4.4 million difference lowers the incumbent share to 80 percent.

<sup>9</sup> On the other hand, consistent with the analyses that we present here, a growing number of regulators have substantially reduced or eliminated price regulation, despite relatively high incumbent market shares. See, for example, Tardiff (2007).

<sup>10</sup> For example, local and long-distance telecommunications, vertical features (call waiting, caller ID, call forwarding), broadband and video may all be provided over common facilities.

The format for the remainder of this paper is as follows. Section II extends the Landes-Posner model of market power to a multi-market setting. Section III demonstrates the manner in which biases in the measurement of market power are likely to arise when the regulator fails to account for demand interdependence and multi-market participation. Section IV demonstrates the “equivalence” between the multi-market measure of market power and the “critical elasticity” measure. The policy implications of this analysis are discussed in Section V. Section VI provides a summary and conclusion. The Appendix formally derives the discrete critical elasticity measure and its relationship with the continuous critical elasticity measure developed in Section IV.

## II. From Single Market to Multi-Market Measures of Market Power

In a classic article, Landes and Posner popularize a measure of market power for the dominant firm that depends upon the dominant firm’s market share,  $s$ ,<sup>11</sup> the market price elasticity of demand,  $\varepsilon_D > 0$ , and the competitive fringe supply elasticity,  $\varepsilon_S > 0$ .<sup>12</sup>

Specifically,

$$L^S = \frac{P - c_d}{P} = \frac{1}{\varepsilon_d} = \frac{s}{\varepsilon_D + (1-s)\varepsilon_S}, \quad (1)$$

where  $L^S$  denotes the Lerner index for the single-market measure of market power,<sup>13</sup>  $P$  is price,  $c_d$  is the dominant firm’s marginal cost and  $\varepsilon_d > 0$  is the price elasticity of

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<sup>11</sup> It should be noted that Landes and Posner (1981, pp. 948 - 949) support a capacity-based measure of market share rather than one based on actual output. The Federal Communications Commission (2004, ¶ 148) endorsed a capacity-based measure of market share in approving a series of mergers in the wireless industry.

<sup>12</sup> This approach was pioneered in a seminal article by Saving (1970).

<sup>13</sup> Lerner (1943, p. 171) observes that “the primary unit to which our measure of monopoly applies is the firm in the very shortest period.”

demand facing the dominant firm.<sup>14</sup> Equation (1) indicates that the dominant firm's market power is increasing with its market share and decreasing with the market elasticity of demand and the competitive fringe supply elasticity, *ceteris paribus*.

In telecommunications markets today, it is common for firms to operate in multiple markets. In fact, one-stop shopping for telecommunications services in the form of the triple or quadruple play is increasingly common.<sup>15, 16</sup> This observation suggests that attempts to measure market power with the use of traditional, single-market metrics is subject to significant error. We seek to determine the magnitude of this error and its implications for continuing regulatory control when it may be unnecessary or worse.

Suppose that there are  $N > 1$  distinct markets, where  $N$  is a positive integer. The profits for the multi-market, dominant firm are given by:

$$\Pi_d = [P^i - c_d^i][D^i(\hat{P}) - S^i(\hat{P})] + \sum_{j \neq i}^N [P^j - c_d^j][D^j(\hat{P}) - S^j(\hat{P})] - F, \quad (2)$$

where  $c_d^i$  is the dominant firm's marginal cost, which is assumed to be constant and separable across markets,  $F$  represents the fixed costs of production,  $D^i$  is aggregate demand,  $\hat{P} = \langle P^1, \dots, P^N \rangle$  is a price vector,  $S^i$  is competitive fringe supply,  $R^i$  denotes dominant firm revenues and  $\varepsilon_d^{ji}$  is the cross-elasticity of demand for the dominant firm. The superscripts indicate the specific market  $i, j = 1, \dots, N, i \neq j$ . Let  $L^M$  denote the Lerner index for the multi-market measure of market power.

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<sup>14</sup> The relationship in (1) holds only when the market operates according to the dominant firm/competitive fringe model and the assumptions of that model hold. It does not hold for other sorts of market equilibria.

<sup>15</sup> This typically entails the joint provision of local telephone service, broadband, video entertainment and possibly wireless.

<sup>16</sup> Dominant firms typically operate in multiple markets and demand interdependence is common. See, for example, Bulow, Geanakoplos and Klemperer (1985).

It can be shown that the multi-market measure of market power in market  $i \neq j$  is given by:<sup>17</sup>

$$L_i^M = \frac{P^i - c_d^i}{P^i} = \left[ \frac{s^i}{\varepsilon_D^i + \varepsilon_S^i(1-s^i)} \right] \times \left[ 1 + \sum_{j \neq i}^N \frac{(P^j - c_d^j) R^j}{P^j} \frac{R^j}{R^i} \varepsilon_d^{ji} \right] = \left[ \frac{s^i}{\varepsilon_D^i + \varepsilon_S^i(1-s^i)} \right] \times [1+k], \quad (3)$$

where  $k = \sum_{j \neq i}^N \frac{(P^j - c_d^j) R^j}{P^j} \frac{R^j}{R^i} \varepsilon_d^{ji} = \sum_{j \neq i}^N L_j^S \frac{R^j}{R^i} \varepsilon_d^{ji}$  is a correction term to account for multi-market participation and demand interdependence.<sup>18</sup> We can conceive of  $k \geq (<) 0$  as a measure of net substitutes (complements) across the firm's multi-market participation. Hence,  $k = 0$  when there is no demand interdependence or multi-market participation. Under these conditions, the multi-market measure of market power in (3) reduces to the single-market measure of market power in (1).

It instructive for the discussion in the next section to derive two alternative expressions for (3). To this end, note that the dominant firm's demand is the residual of market demand and the supply of the competitive fringe,

$$Q_d^j = D^j(\hat{P}) - S^j(\hat{P}). \quad (4)$$

Differentiating (4) with respect to  $P^i$ , multiplying the resulting expression through by  $P^i/Q_d^j$  and simplifying yields

$$\varepsilon_d^{ji} = \left[ \frac{\varepsilon_D^{ji} - (1-s^j)\varepsilon_S^{ji}}{s^j} \right]. \quad (5)$$

Substituting (5) into (3) and simplifying the resulting expression yields our first alternative expression for the multi-market measure of market power:

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<sup>17</sup> See Weisman (2007) for a formal proof of this proposition.

<sup>18</sup> It is straightforward to show that the mark-up rule for a multi-product monopolist with interdependent demands is identical to (3) when  $s^i = 1$  and notational differences in the cross-elasticities are properly accounted for. See Tirole (1988, p. 70). Moreover, in the case of complements, one or more of the goods may be sold below marginal cost, so the Lerner Index may be negative.

$$L_i^M = \frac{P^i - c_d^i}{P^i} = \left[ \frac{s^i}{\varepsilon_D^i + \varepsilon_S^i(1-s^i)} \right] \times \left[ 1 + \sum_{j \neq i}^N \frac{(P^j - c_d^j)}{P^j} \frac{R^j}{R^i} \left( \frac{\varepsilon_D^{ji} - \varepsilon_S^{ji}(1-s^j)}{s^j} \right) \right]. \quad (6)$$

Finally, in the special case of  $N$  identical markets,<sup>19</sup>  $P^i = P^j$ ,  $c_d^i = c_d^j$ ,  $s^i = s^j$  and

$$R^i = R^j. \text{ Also, } \sum_{j \neq i}^N \frac{(P^j - c_d^j)}{P^j} = (N-1) \left[ \frac{P^i - c_d^i}{P^i} \right]. \text{ Making these substitutions in (6) and}$$

simplifying yields the second alternative expression for the multi-market measure of market power:

$$L_i^M = \frac{P^i - c_d^i}{P^i} = \frac{s^i}{[\varepsilon_D^i + (1-s^i)\varepsilon_S^i - (N-1)(\varepsilon_D^{ii} - (1-s^i)\varepsilon_S^{ii})]}. \quad (7)$$

### III. Market Power Measurement Bias

In this section, we explore the bias associated with the use of traditional, single-market measures of market power when  $k \neq 0$ , or when there is demand interdependence and multi-market participation.

*Observation 1.* Relative to the multi-market measure of market power in (3), the single-market measure of market power in (1) overstates (understates) market power in the case of net complements (substitutes), *ceteris paribus*.<sup>21</sup>

In the case of net complements (substitutes),  $k < (>) 0$  in (3), the dominant firm's incentive to raise price in market  $i$  is diminished (enhanced) because doing so decreases (increases) demand in market  $j$ . It follows that the dominant firm's market power is tempered by its participation in complementary markets and augmented by its

<sup>19</sup> Whereas no two markets are likely identical in all respects, two or more markets may be of approximately equal size and share other common characteristics.

<sup>20</sup> In standard fashion, own price effects are assumed to dominate cross price effects. This ensures that the denominator on the right-hand side of (7) is strictly positive.

<sup>21</sup> Cameron and Glick (1996, p. 125) produce a similar result in the context of Cournot competition. In particular, they derive a formula that demonstrates how the standard Herfindahl-Hirschman Index (HHI) overstates market power when firms sell complementary products. See also Weisman (2003).

participation in substitutable markets. To see this directly, recognize that  $k$  can be

expressed as  $k = \sum_{j \neq i}^N \frac{(P^j - c_d^j)}{R^i} s^j D^j(\hat{P}) \varepsilon_d^{ji}$ , which is decreasing (increasing) in  $s^j$  for

$\varepsilon_d^{ji} < (>) 0$  and  $P^j > c_d^j$ , *ceteris paribus*.

**Example 1.** Suppose that the regulated firm participates in multiple markets and that the net complements condition prevails. Specifically, it is assumed that  $s^i = 0.8$ ,  $\varepsilon_D^i = 2$ ,  $\varepsilon_S^i = 1$ ,  $\varepsilon_S^{ji} = 0$  and  $k = -0.3$ . For this parameter set,  $L_i^S = 0.2857$  and  $L_i^M = 0.2$ . Hence, failing to account for multi-market participation and demand interdependence leads the policymaker to overstate market power by almost 43%.

*Observation 3.* The market power of the dominant firm in market  $i$  is (i) decreasing in the competitive fringe own supply elasticity,  $\varepsilon_S^i$ , and (ii) decreasing (increasing) with the absolute value of the cross-elasticity of supply for the competitive fringe,  $|\varepsilon_S^{ji}|$ , when goods  $i$  and  $j$  are complements (substitutes) in production *ceteris paribus*.<sup>22</sup>

When goods  $i$  and  $j$  are complements in production,  $\varepsilon_S^{ji} > 0$ , an increase in  $P^i$  induces the competitive fringe to increase supply in  $j$ . This, in turn, decreases the dominant firm's demand in market  $j$  since  $Q_d^j = D^j(\hat{P}) - S^j(\hat{P})$ . A similar argument explains why the effect is reversed when goods  $i$  and  $j$  are substitutes in production,  $\varepsilon_S^{ji} < 0$ .

In evaluating proposed mergers, the Department of Justice considers the likely supply response should the merging firms attempt to raise prices, *post-merger*.<sup>23, 24</sup> There

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<sup>22</sup> Alternatively, observe from (5) that supply complementarities ( $\varepsilon_S^{ji} > 0$ ) compound the effect of demand complements ( $\varepsilon_d^{ji} < 0$ ) and dampen the effect of demand substitutes ( $\varepsilon_d^{ji} > 0$ ).

<sup>23</sup> See U.S. Department of Justice, *supra* note 1, at Section 3. Section 93 of the Competition Act in Canada would also appear to take such supply considerations into account in evaluating factors that may "substantially lessen competition," *post-merger*.

<sup>24</sup> The FCC's decision to deregulate AT&T in the long-distance market was based largely on its finding that the supply elasticity in the industry was sufficiently high that any attempt on the part of AT&T to

are both own and cross effects to consider. Observe from (6) that market power is decreasing in both the own and cross competitive fringe supply elasticity when  $\varepsilon_S^{ji} > 0$ . Hence, when goods  $i$  and  $j$  are complements in production, the cross-supply elasticity is a compounding influence on the supply response by the competitive fringe in mitigating market power.

*Observation 3.* Suppose that all elasticity measures are independent of the number of markets,  $N$ . The market power for the dominant firm is decreasing (increasing) in  $N$  when  $\varepsilon_d^{ji} < (>)0$ , *ceteris paribus*.

This observation follows directly from differentiating (7) with respect to  $N$ :

$$\frac{\partial}{\partial N} \{L_i^M\} = \frac{s^i [\varepsilon_D^{ji} - (1-s^i)\varepsilon_S^{ji}]}{[\varepsilon_D^i + (1-s^i)\varepsilon_S^i - (N-1)(\varepsilon_D^{ji} - (1-s^i)\varepsilon_S^{ji})]^2} = \frac{(s^i)^2 \varepsilon_d^{ji}}{\Omega^2} \quad (8)$$

upon appeal to (5), where  $\Omega = [\varepsilon_D^i + (1-s^i)\varepsilon_S^i - (N-1)(\varepsilon_D^{ji} - (1-s^i)\varepsilon_S^{ji})]$ . Hence, the sign of (8) is equal to the  $\text{sgn}\{\varepsilon_d^{ji}\}$ .

**Example 2.** The bias in the use of the single-market measure of market power is potentially quite large. Consider the parameter set given by  $s^i = 0.5$ ,  $\varepsilon_D^i = 2$ ,  $\varepsilon_S^i = 1$ ,  $\varepsilon_D^{ji} = -1$ ,  $\varepsilon_S^{ji} = 0$  and  $N = 2$ . For this set of parameters,  $L_i^S = 0.2$  and  $L_i^M = 0.143$ , indicating that the single-market measure of market power overstates actual market power by approximately 40 percent. The upward bias doubles to 80 percent when  $N = 3$ , *ceteris paribus*.

#### IV. Multi-Market Measures of Market Power and Critical Elasticities

It is paradoxical perhaps that the technical conditions of supply (scale/scope economies) that constitute the central economic argument for regulation can, under certain conditions,

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unilaterally raise prices would invite a competitive supply response of such magnitude as to drive prices back to competitive levels. See Federal Communications Commission (1995, ¶¶ 57-8).

actually be relied upon to constrain the market power of the deregulated firm.<sup>25</sup> To see this, recognize that regulated firms typically operate with high price-cost margins due to pronounced scale and scope economies.<sup>26</sup> Hence, price increases that produce even small reductions in demand can generate large losses in contribution to joint and common costs because the firm's revenues decline much more than the costs it can avoid. It is in this manner that high price-cost margins can serve to discipline the deregulated firm's pricing behavior.<sup>27</sup>

The degree to which high price-cost margins constrain market power is indicated by critical fraction or critical elasticity measures. The critical fraction measures the minimum percentage volume loss that would render a contemplated price increase of a given percentage unprofitable. Weisman (2006) derives a critical elasticity measure—the elasticity counterpart to the critical fraction—that accounts for multi-market participation and demand interdependence (complements or substitutes). There is an equivalence between (3), which adjusts the Lerner index to account for demand interdependence and this generalized critical elasticity measure. To see this equivalence, let  $\gamma_i = \frac{P^i}{c_d^i}$  define the price-cost ratio for service  $i$ .<sup>28</sup> It is immediate that

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<sup>25</sup> Even when an industry exhibits characteristics of natural monopoly, *intermodal competition* may render regulation unnecessary because such competition from firms using different technological platforms (or entering from different industries, such as cable into telephony) may impose the requisite level of pricing discipline. See Braeutigam (1989, Chapter 23).

<sup>26</sup> There may be a temptation to conclude that these high price-cost margins are themselves indicative of market power as they may not be sustainable otherwise. And yet, it would seem difficult to argue that a regulated firm operating with high price-cost margins but nonetheless subject to a *de facto* zero profit constraint, at least in the aggregate across the industry, is exercising market power. A possible exception would be a firm that has market power but dissipates what would otherwise accrue as supranormal profits through rent-seeking and rent-defending behavior. See Posner (1975).

<sup>27</sup> See Hausman and Sidak (1999, pp. 477-79) and Hausman (2002, 2003).

<sup>28</sup> Weisman (2006) defines  $\gamma_i$  in terms of the net marginal cost, rather than standard marginal cost. Net marginal cost takes into account the possibility that changes in output for one product produced by a multiproduct firm could lead to cost changes for other products.

$$L_i^S = \frac{P^i - c_d^i}{P^i} = 1 - \frac{c_d^i}{P^i} = 1 - \frac{1}{\gamma_i} = \frac{\gamma_i - 1}{\gamma_i}. \quad (9)$$

Substitute (9) into (3) and solve for  $\varepsilon_d^i = [\varepsilon_D^i + \varepsilon_S^i(1 - s^i)] / s^i$  yields

$$\varepsilon_d^{i*} = \left[ \frac{\gamma^i}{\gamma^i - 1} \right] \left[ 1 + \sum_{j \neq i}^N \frac{(\gamma^j - 1) R^j}{\gamma^j R^i} \varepsilon_d^{ji} \right] = \left[ \frac{\gamma^i}{\gamma^i - 1} \right] [1 + k], \quad (10)$$

where  $\varepsilon_d^{i*}$  is the critical elasticity – the minimum value of the own elasticity facing the dominant firm in market  $i$  that is just sufficient to discourage the firm from raising price (Weisman, 2006).<sup>30</sup>

Consider, for example, an incumbent local exchange carrier (ILEC) that offers the portfolio of services shown in Table 1 with the associated revenues, price-cost ratios and cross-elasticities as indicated. The column marked with a “ $k$ ” reflects the correction factor for the critical elasticity in (10) that accounts for demand interdependence and multi-market participation. As the regulator’s deregulation or forbearance decision frequently focuses on the market for basic local telephone service, we compute the critical elasticity for this service. The critical elasticity is 2.0 when basic local service is

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<sup>29</sup> The high proportion of sunk costs for the regulated firm suggests that avoidable cost is the relevant measure of marginal cost for this analysis. As Mitchell and Vogelsang (1991, p. 9) observe:

In telecommunications networks, production facilities have well-determined capacities, and the costs of operation are nearly independent of the flow of services through those facilities. ... Consequently (except for operator-assisted services) variable costs are very small.

<sup>30</sup> The discrete counterpart to this continuous critical elasticity measure and corresponding critical fraction are given, respectively, by:

$$\varepsilon^* = \frac{1}{[1 + I_p - (c / P_0)]} \quad \text{and} \quad C^* = \frac{I_p}{[1 + I_p - (c / P_0)]},$$

where  $\varepsilon^*$  denotes the critical (arc) elasticity,  $C^*$  denotes the critical fraction,  $I_p$  is the percentage price increase,  $c$  is marginal cost and  $P_0$  is the initial price. See the Appendix for the derivation and the proof that the discrete critical elasticity measure converges to the continuous elasticity measure in (10) when  $I_p$  is “small”. For example, using the five percent hypothetical price increase typically considered by competition authorities when defining product markets, a six percent volume loss for a firm whose current price is five times marginal cost would render an attempted five percent price increase unprofitable. In the examples presented in Tables 2 and 3, we use the continuous formulation rather than the discrete approach described here.

the only service offered in the portfolio. Each service that is added to the portfolio of services changes the critical elasticity by the amount in the last column in the row corresponding to that service. For example, when long distance service is added to the portfolio of services, the critical elasticity decreases to  $1.35 = (2.0 - 0.65)$ . Summing up the values in the last column indicates the cumulative change in the critical elasticity of -1.21. This implies that the critical elasticity for a portfolio consisting of all seven services in Table 1 is  $0.79 = (2.0 - 1.21)$ , as shown in the shaded cells.

**[Table 1 About Here]**

Table 2 indicates how the critical elasticity changes as the ILEC adds services incrementally to its portfolio. The shaded cells along the principal diagonal show the critical elasticity that results from adding the particular service in that row in a cumulative manner to the service(s) in the rows that precede it. For example, the effect of adding broadband to a portfolio consisting of basic local, long distance and vertical services is to decrement the critical elasticity by 0.25, from 0.75 to 0.50.

**[Table 2 About Here]**

Table 3 provides similar information to that in Table 2 except that it is reported in terms of critical reductions in demand volumes. The shaded cells along the principal diagonal show the critical demand reduction values that result from adding the particular service in that row in a cumulative manner to the service(s) in the rows that precede it.

Consider, for example, an ILEC with a service portfolio consisting of basic local, long distance, vertical features and broadband. An ILEC with this service portfolio would not have incentive to raise price by 5% provided that the corresponding reduction in demand volumes is at least 2.5%.<sup>31</sup> The critical demand reduction value decreases (increases) with the addition of services that are complements (substitutes) to basic local telephone service in the portfolio offered by the ILEC. These results suggest that the prospect of even relatively small losses in market share can temper market power even when the incumbent provider enjoys high (“dominant”) market shares. In other words, a little competition can go a long way.

**[Table 3 About Here]**

## **V. Policy Discussion**

The forgoing sections demonstrate that when (1) firms compete by a portfolio of complementary services and (2) they have relatively high fixed/sunk costs and low marginal costs, then the residual market power of the incumbents may be small, even when market shares are at levels that, by traditional standards, may be suggestive of “dominance”. In these circumstances, any benefits to retaining price regulation regimes likely pale in comparison with the costs imposed by distortions to the competitive process and the costs of regulation itself.

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<sup>31</sup> The 5 percent value is generally considered the benchmark for the “small but significant and nontransitory” increase in price called for in the Department of Justice and the Federal Trade Commission. *Horizontal Merger Guidelines*, 1992 at § 1.0.

Recent developments in the United States, Canada, and elsewhere indicate that there has been profound change in the scope of retail price regulation, even to the point of approximating full deregulation in some cases. This has occurred despite calls from some parties that incumbent market shares are at levels suggestive of continued dominance, at least by traditional standards. The fact that some regulators have seen fit to deregulate even when incumbent market shares are relatively high indicates that they have begun to question the validity of such simple metrics in drawing inferences about market power.

In particular, in the United States, there has been significant growth in “intermodal” competition, primarily in the form of mobile wireless and cable telephony, as shown in Figure 1.<sup>32</sup> ILECs have been steadily losing volume since the beginning of the decade and all providers of wired services (both incumbents and their competitors) have lost volumes in recent years. In contrast, mobile wireless volumes have grown rapidly. For example, in comparison with the beginning of the decade, when wireless volumes were only 42 percent of wireline volumes, by the middle of 2007, wireless volume exceeded wireline volumes by 42 percent. Moreover, as of the first half of 2007, fourteen percent of US households had “cut the cord” and no longer maintain wired service (Blumberg and Luke (2007)).

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<sup>32</sup> Figures 1 and 2 and Table 4 are based on data from the Federal Communications Commission (2008), which reports the number of end-user lines provided by incumbents and entrants semiannually since the end of 1999. In earlier years, the number of cable telephony lines was quite close to the corresponding number reported by the National Cable & Telecommunications Association (NCTA). However, because the FCC’s data reports substantially few such lines since the middle of 2005, we have adjusted that data since then to coincide with the figures reported by NCTA (2007).

**[Figure 1 About Here]**

Figure 2<sup>33</sup> illustrates how the shares of entry modes—full facilities-based, switched based,<sup>34</sup> and resale of incumbents’ facilities—has shifted over time. These shifts in the competitive landscape reflect, in part, a more conservative approach by the FCC concerning mandatory sharing of network elements at regulated prices.<sup>35</sup> Up until 2003, the growth in competitors’ lines was dominated by providers who relied exclusively on wholesale inputs (unbundled network element platform or (UNE-P) or resold lines) rather than deploying their own network facilities. The change in policy to less accommodative entry coincided with a diminution in the exclusive use of wholesale network inputs and a rapid increase in the number of competitive lines that wholly or partially utilize competitor-owned facilities.

**[Figure 2 About Here]**

Table 4 compares the volumes represented in Figure 2 for two reporting periods: June 2003—immediately before the release of the FCC’s Triennial Review Order (Federal Communications Commission, 2003), which signaled the beginning of the end of the mandatory availability of the unbundled element platform at regulated prices and

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<sup>33</sup> The reduction in competitors’ lines after 2005 is explained in large part by the fact that the acquisitions of AT&T by SBC and MCI by Verizon resulted in lines that were formerly classified as competitors’ lines being reclassified as incumbent lines after the mergers were approved.

<sup>34</sup> In Figure 2, a switch-based provider owns its own switches, but obtains loop facilities—unbundled network element loops or UNE-L—the wires and supporting structures between its switch and the customers) as wholesale inputs from the incumbent.

<sup>35</sup> Tardiff (2007) and Robinson and Weisman (2008) provide additional details on these developments.

June 2007—the most recent period. While total wired competitor lines grew by 23 percent, the growth rates for full facilities-based (particularly intermodal lines) were substantially higher—indeed the number of intermodal (i.e., cable telephone) lines almost tripled over the period. Unbundled loops (UNE-L) grew at about the same rate as did total lines over the period, while UNE-P lines fell by 43 percent. Overall, lines that required some use of competitor-owned facilities (intramodal facilities-based, intermodal, and UNE-L (with competitor-owned switching)) almost doubled, while the modes of entry that require no CLEC network facilities (UNE-P plus resale) fell by about 22 percent. As a result, while in 2003, users of wholesale inputs accounted for slightly over 60 percent of competitors' lines, the mix of entry modes has shifted so that four years later 60 percent of lines are now supplied either fully or partially with network facilities owned by competitors.

**[Table 4 About Here]**

Local exchange competition in Canada has accelerated in recent years, primarily due to the inroads by cable telephony providers of residential services. As shown in Figure 3,<sup>36</sup> while total wired lines have been relatively flat since 2001, the number of lines served by competitors has grown substantially—the competitors' share almost tripled between 2003 and 2006 from five percent to almost 15 percent.

**[Figure 3 About Here]**

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<sup>36</sup> Figure 3 is based on data reported in CRTC (2006b and 2007).

In North America, there has been a trend towards relaxed regulation or deregulation of retail prices in a manner that suggests regulators are discounting the significance of single-market share metrics to infer market power. For example, as of October 2006, the regulatory authorities and/or legislative processes in at least thirty-one of the 50 U.S. states had relaxed regulation (or completely deregulated) the retail services of incumbent local exchange carriers (Tardiff, 2007). In California, the regulatory authority explicitly concluded that the larger ILECs no longer have market power sufficient to justify price regulation and as a result effectively deregulated all services except for basic residential service. This decision was based on the myriad of competitive alternatives available to consumers, including wireless, cable telephony, and other facilities-based carriers in addition to the continued availability of wholesale inputs under the 1996. Telecom Act (California Public Utilities Commission, 2006).<sup>37</sup>

The path to more streamlined regulation or forbearance in Canada is perhaps even more closely aligned with the formal analysis presented here and the fact that competitive inroads have materialized at a relatively rapid pace.<sup>38</sup> Although one of the parties to the forbearance proceeding proposed an approach that (1) was similar to the deregulatory framework that was ultimately adopted; and (2) is broadly consistent with our conclusion that competitive inroads into telecommunications quickly erode market power, the Canadian regulator initially adopted a market share test for determining whether there was sufficient competition in a particular geographic area to warrant deregulation.

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<sup>37</sup> Due to the need to address low income and high-cost funding issues, residential rates will be frozen until January 1, 2009. After this time, there will be no cap on residential rates, except perhaps in those areas receiving high-cost support.

<sup>38</sup> Brennan (2008) provides a comprehensive account of these developments.

Specifically, the Canadian Radio-television and Telecommunications Commission (CRTC, 2006a) established a process for determining when it will forbear from regulating certain aspects of regulating basic exchange services. Those determinations would be made with respect to geographic markets that for the most part are defined as the Census Metropolitan Areas. The relevant product market includes VoIP (both facilities-based and services provided third parties, such as Vonage, over broadband facilities), but not wireless. Forbearance would have been granted when (1) incumbents had experienced a 25 percent market share loss, (2) they had demonstrated that rivalrous behavior exists in the market, and (3) they had satisfied other conditions related to quality of service and the provision of wholesale services to competitors. Finally, despite the fact that the rationale for forbearance is that competition is sufficient to ensure reasonable prices, the CRTC's decision nonetheless imposes a price ceiling on stand-alone residential service.

The Canadian ILECs requested reconsideration of the CRTC's decision and in response the Minister of Industry proposed and the Governor in Council (Industry Canada, 2007) ordered a new forbearance framework be used. This new framework (1) replaced the CRTC's market share criterion with a test in which the presence of two additional facilities-based offering services throughout the market would be the basis for forbearance;<sup>39</sup> (2) reduced the size of geographic markets to local exchanges; and (3) limited somewhat the quality-of-service standards.<sup>40</sup> In the case of residential services,

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<sup>39</sup> In particular, a facilities-based provider that satisfies this criterion is one which is capable of serving at least 75 percent of the local exchange lines in the geographic area at issue with either its own facilities or a combination of its own facilities and services leased from other providers.

<sup>40</sup> The CRTC's decision would have required the applicant to meet 14 specific standards averaged over the sixth months preceding the application. The Governor in Council eliminated five of the 14 standards and increased the window for the six month period from eight months before the application to any time before the CRTC renders a decision on the application.

the competitive presence criterion allows one of the two additional competitors to be an unaffiliated wireless provider, which effectively negates the CRTC's determination that wireless and traditional telephone services are not in the same product market.

Although the forbearance determination is made on an exchange-by-exchange basis, a substantial proportion of incumbents' lines have already been forborne. TELUS, for example, applied for and was granted forbearance in geographic areas that account for approximately three-quarters of its residential lines and two-thirds of its business lines (TELUS, 2007, p. 56).

## **VI. Conclusion**

Regulators commonly view a dominant provider as a firm with the ability to leverage significant market power. The market share of the provider in the particular market is commonly used by regulators to draw inferences about dominance. In telecommunications markets, in particular, where demand complementarities, multi-market participation, and high price/cost margins are the norm, traditional, single-market measures of market power are likely to seriously overstate extant market power. This leads to a paradox in which a multi-market provider that is seemingly dominant in each market if considered in isolation may not be able to leverage that "dominance" to exercise significant market power in any market. Under these conditions, the erosion of market power can occur long before incumbents have lost significant amounts of market share. Consequently, as credible assessment of market power must recognize that a little competition can go a long way.

From the perspective of public policy, such biases in the measurement of market power have potentially serious consequences. To wit, antitrust authorities may be

disinclined to approve mergers and regulators may be reluctant to deregulate or forbear if they rely upon metrics that overstate market power. In other words, policymakers must begin to recognize the degree to which demand interdependence and multi-market participation can serve to place natural limits on the exercise of significant market power. The recent deregulatory trends in retail telecommunications markets in the U.S. and Canada in the face of relatively high incumbent market shares may indicate that this recognition process has already begun.

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<b>SERVICE</b>	$\gamma_{i,j}$	$\varepsilon_d^{ji}$	$R^i, R^j$	$k$	$\varepsilon_{ii}^*$	$\Delta\varepsilon_{ii}^*$
Basic Local	2	---	100	---	2	---
Long Distance	10	-0.30	80	-0.325	1.35	-0.65
Vertical Features	20	-0.30	70	-0.300	1.40	-0.60
Broadband	15	-0.25	35	-0.125	1.75	-0.25
Video Entertain.	15	-0.20	10	-0.030	1.94	-0.06
Wireless	5	0.20	60	0.145	2.29	0.29
VoIP	5	0.25	10	0.030	2.06	0.06
<b>Total</b>	---	---	---	-0.605	0.79	-1.21

**Table 1. Hypothetical ILEC Parameter Values**

<b>SERVICE</b>	BL	+LD	+VF	+BB	+VE	+WS	+VP
Basic Local	2	---	---	---	---	---	---
Long Distance	-0.65	1.35	---	---	---	---	---
Vertical Features	-0.65	-0.60	0.75	---	---	---	---
Broadband	-0.65	-0.60	-0.25	0.50	--	---	---
Video Entertain.	-0.65	-0.60	-0.25	-0.06	0.44	---	---
Wireless	-0.65	-0.60	-0.25	-0.06	0.29	0.73	---
VoIP	-0.65	-0.60	-0.25	-0.06	0.29	0.06	0.79

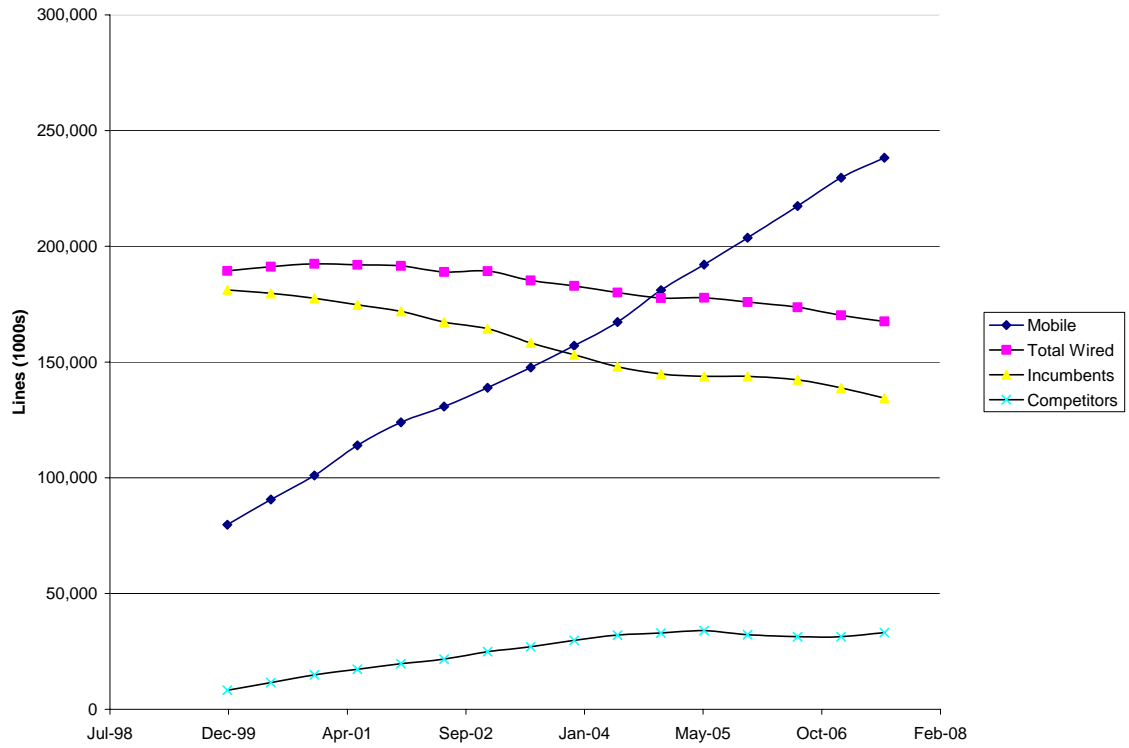
**Table 2. Critical Elasticities for Hypothetical ILEC**

<b>SERVICE</b>	<b>BL</b>	<b>+LD</b>	<b>+VF</b>	<b>+BB</b>	<b>+VE</b>	<b>+WS</b>	<b>+VP</b>
Basic Local	10%	---	---	---	---	---	---
Long Distance	-3.25%	6.75%	---	---	---	---	---
Vertical Features	-3.25%	-3.00%	3.75%	---	---	---	---
Broadband	-3.25%	-3.00%	-1.25%	2.50%	--	---	---
Video Entertain.	-3.25%	-3.00%	-1.25%	-0.30%	2.20%	---	---
Wireless	-3.25%	-3.00%	-1.25%	-0.30%	1.45%	3.65%	---
VoIP	-3.25%	-3.00%	-1.25%	-0.30%	1.45%	0.30%	3.95%

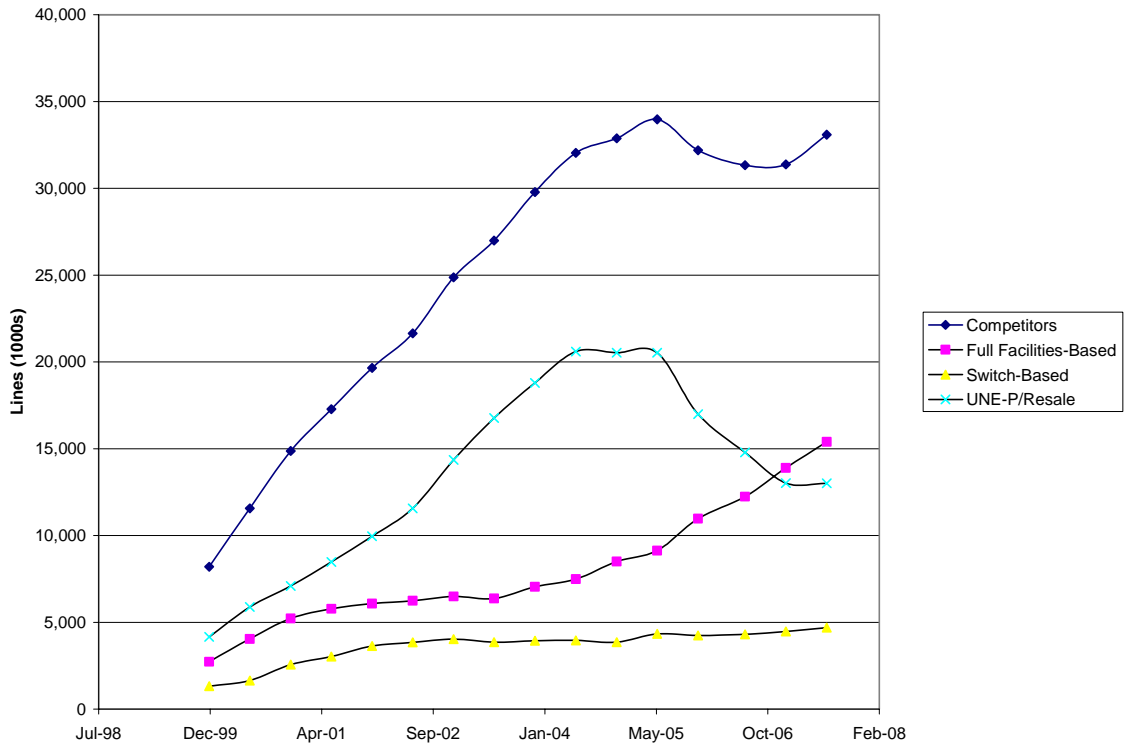
**Table 3. Critical Percentage Reduction in ILEC Demand Volumes for  $\% \Delta P = 5\%$**

	<b>June-03</b>	<b>June-07</b>	<b>% Change</b>
Intermodal	3,123	12,100	287.4%
Intramodal Facilities- Based	3,247	3,295	1.5%
UNE-L	3,851	4,688	21.7%
UNE-P	11,877	6,817	-42.6%
Resale	4,887	6,184	26.5%
UNE-P/Resale	16,764	13,001	-22.4%
Other	10,221	20,083	96.5%
Total	26,985	33,084	22.6%
% UNE-P/Resale	62.1%	39.3%	

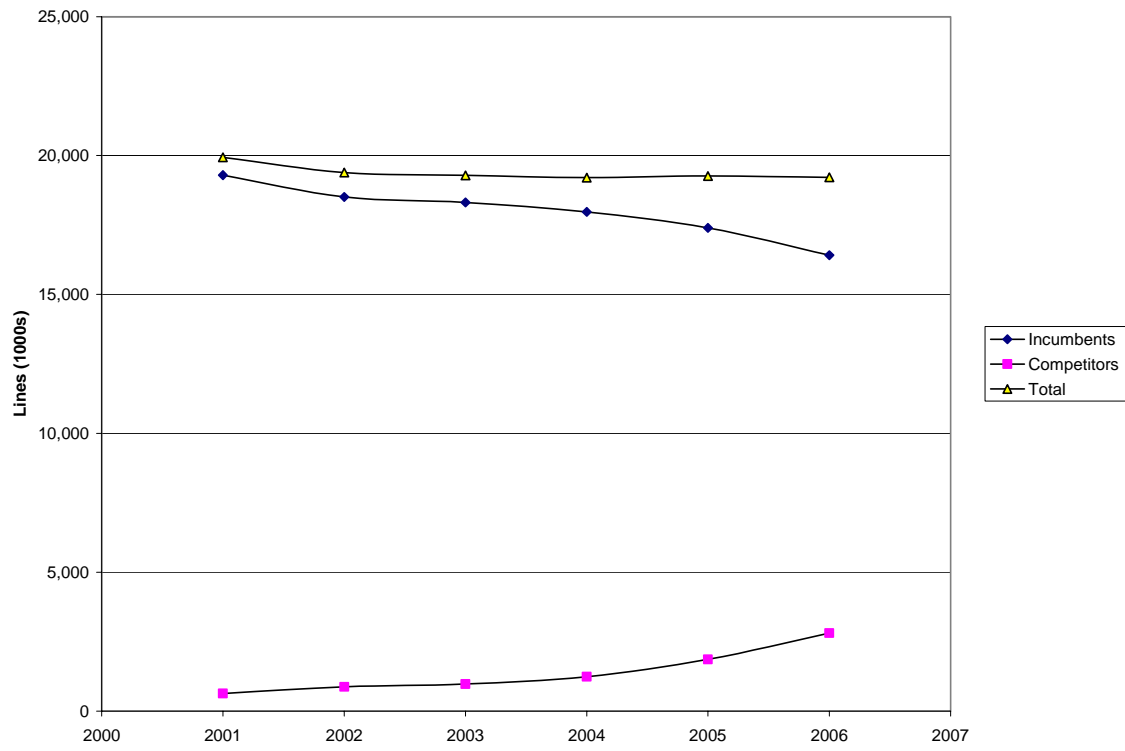
**Table 4. Change in Pattern of Competitive Entry: 2003 – 2007**



**Figure 1. Trend in U.S. Mobile and Wireline Volumes**



**Figure 2. Trend in Competitors' Entry Modes in the U.S.**



**Figure 3. Trend in Canadian Wireline Volumes**

## Appendix

Define the initial profits for the firm by

$$\pi_0 = Q_0[P_0 - c], \quad (\text{A1})$$

where  $Q_0$  is the initial quantity,  $P_0$  is the initial price and  $c$  is constant marginal cost. The objective is to find the critical fraction of demand reduction,  $C^*$ , following a contemplated percentage price increase of  $I_p$  that would generate the same level of profit. This implies that

$$\pi_0 = Q_0[P_0 - c] = Q_1[(1 + I_p)P_0 - c] = \pi_1, \quad (\text{A2})$$

where  $Q_1$  is the new quantity following the price increase, and  $\pi_1$  is the new level of profit. Solving (A2) for the demand ratio,  $Q_1 / Q_0$ , yields

$$\frac{Q_1}{Q_0} = \frac{[P_0 - c]}{[(1 + I_p)P_0 - c]}. \quad (\text{A3})$$

Subtracting 1 from both sides of (A3) and simplifying yields

$$\frac{Q_1}{Q_0} - 1 = \frac{Q_1 - Q_0}{Q_0} = \frac{-I_p}{[1 + I_p - c/P_0]}. \quad (\text{A4})$$

Taking the absolute value of both sides of (A4) yields

$$C^* = \frac{I_p}{[1 + I_p - (c/P_0)]}. \quad (\text{A5})$$

Divide both sides of (A5) by  $I_p$  to obtain

$$\frac{C^*}{I_p} = \frac{1}{[1 + I_p - (c/P_0)]}. \quad (\text{A6})$$

Take the limit of (A6) as  $I_p \rightarrow 0$ , which corresponds to an infinitesimally small price change, to obtain

$$\lim_{I_p \rightarrow 0} \left( \frac{C^*}{I_p} \right) = \frac{1}{[1 - (c/P_0)]}, \text{ or} \quad (\text{A7})$$

$$\varepsilon^* = \frac{1}{[1 - (c/P_0)]} = \frac{1}{1 - (1/\gamma)} = \frac{\gamma}{\gamma - 1}. \quad (\text{A8})$$

The term on the far right-hand side of (A8) is the expression for the continuous critical elasticity measure in (10) when the firm operates in a single market, or when  $k = 0$ .