REGULATION IN VERTICALLY-RELATED INDUSTRIES:

MYTHS, FACTS, AND POLICY

by

David E. M. Sappington*

ABSTRACT

This paper explains why conclusions that appear to be "facts" can truly be "myths" in industries like today's telecommunications industry, where key suppliers operate in multiple vertical stages of production. The paper explains, for example, why an entrant's decision to make or buy critical production inputs may be largely insensitive to the price of these inputs. It also reviews why a vertically-integrated producer (VIP) may prefer to assist, rather than disadvantage, retail rivals, and why a VIP may be disadvantaging rivals even when it provides them with the same wholesale service quality that it provides to its own retail affiliate.

June 2005

* University of Florida.

I thank the Organizing Committee of the International Industrial Organization Society for the privilege of presenting this paper at the Third Annual International Industrial Organization Conference. I also thank Timothy Brennan, Vivek Ghosal, Michael Riordan, and Christopher Snyder for helpful comments.

1. Introduction.

Economic analysis can be of particular value to policymakers when it delivers unequivocal predictions and offers clear policy guidance. Unfortunately, simple, precise guidance can be difficult to develop in industries like today's telecommunications industry, where key suppliers operate in multiple vertical stages of production. In the telecommunications industry, incumbent local exchange carriers (ILECs) such as the "Baby Bells" operate at both the wholesale and the retail stages of production. ILECs both sell critical inputs such as the local loop[1] to competitive local exchange carriers (CLECs) and provide retail services (e.g., basic local telephone service) directly to consumers.

Participation in multiple industry stages can complicate incentives and actions considerably, rendering false what may appear to be obvious economic facts. For example, a CLEC's decision to make or buy critical production inputs may be largely insensitive to the price of these inputs. In addition, a vertically-integrated producer (VIP) may prefer to assist, rather than disadvantage, retail rivals.

The difficulty in developing simple, unequivocal policy guidance in vertically-related industries like the telecommunications industry is illustrated here by stating six economic myths. Although each of these myths might seem to be an obvious fact, the myths are all false. The ensuing discussion emphasizes the intricacies that arise when industry participants operate in multiple vertical stages of production, and illustrates how these intricacies can cause apparent facts to be myths.

It is important to note at the outset that the six myths reviewed in this article are not intended to illustrate all relevant complications that arise in industries where key suppliers operate at multiple stages of production.[2] Furthermore, because the conclusions drawn in this article primarily summarize findings that have been derived in complete detail elsewhere, little technical detail is presented here. Instead, the focus is on intuitive interpretations of selected basic principles.[3]

---

[1] The local loop is the wire that carries telecommunications messages from a supplier's central office to a customer's premise.

[2] See Wright (2004) for an insightful discussion of the problems that can arise in applying facts from standard (one-sided) markets in two-sided markets.

[3] As is evident from the references cited in this article, the discussion is drawn disproportionately from my own recent research. I apologize in advance to the many authors whose important work on related issues is not reviewed adequately in the ensuing discussion.

The discussion proceeds as follows. Section 2 reviews how input prices affect make-or-buy decisions, and thus industry production costs. Section 3 considers the merits of allowing industry participants to negotiate input prices, free of regulatory oversight. Section 4 analyzes the incentives a VIP may have to disadvantage retail competitors. Section 5 considers policies for detecting and deterring such disadvantaging of rivals. Section 6 concludes by reviewing the six economic myths and six corresponding economic facts, and by noting important policy issues that warrant further study.

2. Setting Input Prices to Minimize Industry Production Costs.

The Telecommunications Act of 1996 ("the Act")[4] promoted ILEC operation at both the wholesale and the retail stages of production in the U. S. telecommunications industry. The Act required ILECs to sell key production inputs (such as the local loop) to CLECs, so that CLECs would not have to build entire networks from scratch in order to deliver retail telecommunications services to customers.

The prices that ILECs charge for the inputs they sell to CLECs reflect TELRIC principles. TELRIC denotes "Total Element Long Run Incremental Cost". A TELRIC price for an input can be viewed as the long-run average cost an efficient (i.e., cost-minimizing) producer incurs to produce the input.[5]

TELRIC prices for inputs have been advocated in part on the grounds that they promote industry cost minimization.[6] The simple argument that underlies this assertion is explained most readily in the case where ILEC is an efficient (cost-minimizing) input provider.[7] In this case, when an input price is set equal to the ILEC's (efficient) unit cost of producing the input, a CLEC will incur lower input costs when it produces the input itself than when it buys the input from the ILEC if and only if the CLEC can produce the input at lower cost than the incumbent.

---

[4] Pub. L. No. 104-104, 100 Stat. 56 (codified at 47 U.S.C. §§ 151 *et seq.*)

[5] In calculating TELRIC prices for an ILEC, the locations of the ILEC's wire centers are taken as given. Therefore, not all factors of production are assumed to be variable in calculating long-run incremental cost. See Rosston and Noll (2002), for example, for additional discussion of TELRIC prices.

[6] The Federal Communications Commission (1996, ¶630) states that "prices based on forward-looking long-run incremental costs . . . ensure efficient entry and utilization of the telecommunications infrastructure."

[7] Because TELRIC prices primarily reflect the costs of a hypothetical cost-minimizing ILEC rather than the actual costs of any particular ILEC, TELRIC prices can provide strong incentives for ILECs to minimize their operating costs.

In contrast, if the price for the ILEC's input (w) exceeds the ILEC's unit cost of production (c_u^I), a CLEC whose unit cost of producing the input ($c_u^E \in (c_u^I, w)$) exceeds the ILEC's unit cost may find it less costly to make the input itself than to buy the input from the ILEC. Similarly, if the input price is set below the ILEC's unit production cost, a CLEC that can produce the input at lower cost ($c_u^E \in (w, c_u^I)$) than the ILEC may nevertheless minimize its input costs by purchasing the input from the incumbent.

This logic suggests that TELRIC pricing may be necessary to ensure industry cost minimization by inducing CLECs to make efficient "make-or-buy" decisions. This conclusion is recorded here as Myth 1.

Myth 1. TELRIC pricing of inputs is necessary to ensure efficient make-or-buy decisions.

Myth 1 is not a fact because it ignores the downstream (retail) interaction between the CLEC and the ILEC. In addition to affecting its input costs directly, a CLEC's make-or-buy decision can affect its retail profit by altering the intensity of retail price competition. In particular, a CLEC may choose to purchase an essential input from an ILEC even when the price of the input exceeds both the ILEC's and the CLEC's production cost because doing so can garner higher retail profit for the CLEC by inducing the ILEC to compete less aggressively downstream.

To illustrate the potential importance of these retail competition considerations, consider a setting where an ILEC and a CLEC offer differentiated products and engage in Hotelling (1929) price competition after the CLEC has decided whether to buy a single essential input from the ILEC or to produce the input itself.[8] Each unit of this upstream input must be combined with one unit of a downstream input to produce one unit of the retail product. The ILEC and the CLEC each produce their own downstream input. For simplicity, all inputs are produced at a constant unit cost. The ILEC's unit costs of producing the upstream input and the downstream input are denoted c_u^I and c_d^I, respectively. The corresponding unit costs of the CLEC are denoted c_u^E and c_d^E, respectively.

Each consumer has perfectly inelastic demand up to a known reservation price for (exactly) one unit of the retail product. (This retail product might be viewed as basic local

[8] The ensuing discussion is drawn from Sappington (2005a).

telephone service, for example.) The ILEC's and the CLEC's production costs are assumed to be sufficiently similar and sufficiently low such that, in equilibrium, both firms serve some retail customers and all potential customers purchase one unit of the retail product.

The nature of retail price competition is straightforward in this simple setting when the CLEC decides to make the upstream input itself. In this "make regime", the ILEC and the CLEC incur unit costs $c_u^I + c_d^I$ and $c_u^E + c_d^E$, respectively. The two firms set prices simultaneously and independently to maximize their profits, given these production costs.

The corresponding analysis differs somewhat when the CLEC decides to buy the upstream input from the ILEC. In this "buy regime", the CLEC's unit cost of production is the sum of the unit price it pays for the upstream input (w) and its downstream unit cost (c_d^E). The ILEC's perceived unit cost of expanding its retail output is a bit more subtle. When it delivers a unit of the retail product to an additional retail customer, the ILEC incurs a physical unit cost equal to the sum of its upstream and downstream unit production costs, $c_u^I + c_d^I$. The ILEC also incurs an opportunity cost of $w - c_u^I$. This opportunity cost is the profit the ILEC foregoes because it displaces the CLEC as the customer's service provider, and so the CLEC no longer purchases the essential upstream input needed to serve this customer.[9] The sum of the ILEC's physical and opportunity unit cost of expanding retail production in the buy regime is $w + c_d^I$ (= $(c_u^I + c_d^I) + (w - c_u^I)$). This is the unit cost the ILEC considers when it chooses its profit-maximizing retail price in the buy regime.

It follows that the CLEC's decision to make or to buy the upstream input influences the ILEC's perceived unit operating cost, and thus the CLEC's cost advantage or cost disadvantage in the ensuing retail price competition. In the setting under consideration (and more generally), the CLEC's equilibrium profit increases as its unit production cost declines relative to the ILEC's unit cost. The CLEC's cost advantage in the make regime is:

$$(c_u^I + c_d^I) - (c_u^E + c_d^E) = c_d^I - c_d^E + (c_u^I - c_u^E). \quad (1)$$

The CLEC's corresponding cost advantage in the buy regime is:

[9] Armstrong et al. (1994, pp. 135-6), Sibley and Weisman (1998), Chen (2001), and Armstrong (2002), among others, note that a VIP experiences an opportunity cost that reflects foregone profit on sales to retail competitors when it expands its retail output.

$$(w + c_d^I) \; - \; (w + c_d^E) \; = \; c_d^I \; - \; c_d^E . \qquad (2)$$

It is apparent from equations (1) and (2) that the CLEC's equilibrium profit will be higher under the make regime than under the buy regime if and only if $c_u^I > c_u^E$, i.e., if and only if the CLEC can produce the upstream input at lower cost than the ILEC. Consequently, the CLEC will choose to make the upstream input whenever it can to do at lower cost than the ILEC. In contrast, the CLEC will buy the upstream input from the ILEC whenever the ILEC can produce the input at lower cost than the CLEC.

Two aspects of these conclusions are of central importance. First, the CLEC's profit-maximizing choice of regime ensures industry cost minimization. The least-cost supplier of the upstream input is always the one that produces the input in equilibrium in this setting. Second, industry cost minimization is ensured for all values of the input price, w. Therefore, while a "TELRIC price" ($w = c_u^I$) will ensure the efficient make-or-buy decision in the setting considered here, so will any other price for the ILEC's upstream input. Consequently, Myth 1 is appropriately replaced by Fact 1.

Fact 1. An entrant's make-or-buy decision may be largely insensitive to the prices set for key inputs.

Intuitively, TELRIC prices are not always necessary to ensure efficient make-or-buy decisions because a CLEC may be willing to buy the input from a more efficient ILEC even if the input is priced above the ILEC's (and the CLEC's) upstream unit cost. Although the CLEC pays a relatively high price for the upstream input in this case, the CLEC reduces the intensity of retail price competition by choosing to purchase the input from the ILEC.[10] When $w > c_u^I$, the ILEC will price its retail product less aggressively in the buy regime than in the make regime,

[10] Of course, the CLEC will be unable to diminish the intensity of retail price competition through its make-or-buy decision if the ILEC is not free to choose its retail prices (e.g., when these prices are regulated). In such a setting, it is typically necessary for input prices to reflect the ILEC's unit production costs to ensure efficient make-or-buy decisions. See Armstrong (2001, 2002), for example.

recognizing that a "win" in the retail market imposes a "loss" in the wholesale market. The loss is the diminished profit from reduced sales of the input to the CLEC.[11]

In summary, when participation at multiple stages of production complicates the incentives of key industry players, conclusions that might appear to be obvious economic facts may actually be myths.

3. Delegated Input Pricing.

The analysis in section 2 considered how a regulator might set prices for the essential inputs a VIP supplies to a retail competitor. In some settings, regulators might consider allowing industry participants to negotiate mutually acceptable prices for key inputs. Indeed, in 2004, the chairman of the Federal Communications Commission encouraged ILECs and CLECs to "work earnestly to arrive at commercially negotiated rates" for these inputs (Powell, 2004). One might conjecture that if ILECs and CLECs have comparable bargaining power, their divergent interests and their superior knowledge of production costs might lead them to negotiate input prices that induce efficient make-or-buy decisions and promote reasonable retail prices. This conjecture is restated as Myth 2.

Myth 2. If a VIP and a rival downstream competitor have equal bargaining power and if bargaining is costless, delegated input pricing will result in industry cost minimization and promote reasonable retail prices for consumers.

The same logic that explains why Myth 1 is not a fact also reveals the fallacy in Myth 2.[12] As noted in section 2, a retail rival may be willing to pay a relatively high price for an input supplied by a VIP because doing so can induce the VIP to price its retail product less aggressively. Consequently, the retail rival and the VIP both may benefit financially from a high

[11] Similarly, a CLEC will not necessarily find it profitable to buy an upstream input from an ILEC when the input is priced below the ILEC's (and the CLEC's) upstream unit cost of production. When the ILEC suffers a financial loss on each unit of the upstream input it sells to the CLEC, the ILEC will engage in particularly aggressive retail price competition in order to limit the number of customers the CLEC serves, and thus the number of units of the upstream input the CLEC purchases. On balance, if the CLEC is the least-cost supplier of the upstream input, it may prefer to make, rather than buy, the "under-priced" upstream input in order to avoid particularly aggressive retail price competition.

[12] The ensuing discussion is drawn from Sappington and Unel (2005). Also see Harbord and Ottaviani (2002).

input price. Therefore, when permitted to negotiate an input price without regulatory intervention, a VIP and a retail rival may both find it profitable to set an input price well in excess of relevant production costs.[13] This high input price, in turn, can result in high retail prices for consumers. Thus, although delegated input pricing may avoid regulatory delays, limit regulatory posturing by industry participants, and place decision-making authority in the hands of those who are best informed about relevant industry condition, delegated input pricing will not always serve the best interests of retail customers. This conclusion is summarized in Fact 2.

Fact 2. Even if they have equal bargaining power, a VIP and a retail competitor may employ the authority to negotiate input prices to establish high input prices that produce high retail prices.

Again, then, operation at multiple stages of production can complicate incentives and produce counterintuitive conclusions.

4. Incentives to Disadvantage Rivals.

A firm typically enjoys greater profit in a retail market as its rivals' costs increase. The cost increases generally induce rivals to raise their prices or reduce their output, both of which can increase the revenue of a retail competitor.[14] One might therefore conjecture that when a VIP and a rival compete directly for retail customers, the VIP will always wish to use its position as a supplier of key inputs to raise the operating costs of its retail rival.[15,16] This conjecture is recorded here as Myth 3.

---

[13] This conclusion parallels the finding that a high reciprocal interconnection fee can reduce the incentive of a network operator to unilaterally reduce the linear price it charges to its customers, and thereby foster high retail prices for all network operators. See, for example, Brennan (1997), Armstrong (1998), and Laffont et al. (1998a, b). Also see Wright (2002).

[14] See, for example, Salop and Scheffman (1983, 1987).

[15] Economides (1998) provides conditions under which a vertically-integrated provider will find it profitable to raise the costs of a retail rival. Also see Mandy (2000).

[16] A vertically-integrated ILEC might attempt to raise the costs of a rival CLEC by, for example, making it more difficult for the CLEC's technicians to complete their interconnection tasks quickly and easily while on site at the ILEC's production facilities.

Myth 3. It is always advantageous for a VIP to raise the costs of its retail rivals.

Despite its intuitive appeal, Myth 3 is not a fact. Myth 3 is incorrect because although a VIP's retail profit may increase as its rivals' production costs increase, the VIP's wholesale profit can decline by more than its retail profit increases. This is the case because when a rival's production cost increases, the rival typically reduces its retail output. Consequently the rival's derived demand for the essential inputs it purchases from the VIP declines. When the profit margins the VIP enjoys on the inputs it sells to retail rivals are sufficiently pronounced, the VIP can suffer a substantial financial loss from the reduced sale of inputs.[17]

All else equal, a VIP gains the least (or suffers the most) from an increase in the costs of a retail rival when the rival has a pronounced cost advantage in serving retail customers.[18] When the VIP's retail production costs are relatively high, the VIP enjoys little incremental retail profit as its retail sales increase due to the increase in the costs of its retail rival. Therefore, by raising the costs of a more efficient rival, a VIP may primarily reduce its wholesale profit, with little offsetting increase in retail profit. These observations underlie Fact 3.

Fact 3. A VIP may not wish to raise the costs of a downstream rival if the rival's downstream cost advantage is sufficiently pronounced.

Although a VIP may prefer to reduce rather than increase the costs of a more efficient retail rival, it may have substantial incentive to raise the costs of a less efficient rival. The losses the VIP experiences from reduced demand for its inputs in this case can be outweighed by the substantial increase in retail profit the VIP enjoys as it serves more retail customers at relatively low incremental cost. One might naturally surmise, therefore, that a VIP also would benefit from reducing the demand for the product of a less efficient retail competitor.[19] This conjecture is recorded formally as Myth 4.

---

[17] See Weisman (1995) and Sibley and Weisman (1998), for example.

[18] See Sibley and Weisman (1998) or Mandy (2000), for example.

[19] Gilbert and Riordan (2005) analyze the incentives of a VIP to reduce the demand for the products of retail rivals by designing a key input to work better on the VIP's operating system than on the systems of retail rivals.

Myth 4. It is always advantageous for a VIP to reduce the demand for the retail products of less-efficient retail rivals.

Myth 4 is not correct because a retail rival may react differently to a reduction in the demand for its products than it does to an increase in its operating costs. In particular, when producers engage in retail price competition, a firm typically will raise its price when its costs increase. In contrast, a firm often will reduce the price it charges for a product as the demand for the product declines.[20] A producer usually enjoys higher profit when its rivals raise their prices. In contrast, a producer typically suffers a reduction in profit when its rivals lower their prices. Therefore, a VIP may have no interest in reducing the demand for the products of retail rivals (and thereby inducing them to lower their prices) even when the VIP would gain financially from raising its rivals' costs (and thereby inducing them to raise their retail prices).[21] This conclusion is stated as Fact 4.

Fact 4. Even under conditions that ensure a VIP would benefit financially from raising the operating costs of a retail rival, the VIP may not find it profitable to reduce the demand for the rival's products.

Thus, whether a VIP wishes to assist or disadvantage a retail rival can depend upon both the relative costs of the two firms and the exact nature of the relevant assistance or hindrance.

5. Detecting Attempts to Disadvantage Rivals.

Recognizing that ILEC's may have incentives to disadvantage rivals in some settings, many state telecommunications regulatory commissions have instituted performance measurement and remedy (PMR) plans.[22] These plans specify methodologies for determining whether ILECs are disadvantaging CLECs. The plans also specify the financial penalties that are imposed on an ILEC that is determined to have disadvantaged rival CLECs.

[20] See, for example, Bulow et al. (1985).

[21] See Mandy and Sappington (2005) for a formal proof of this conclusion.

[22] See, for example, Michigan Public Service Commission (2001).

PMR plans often specify that an ILEC will be judged to have disadvantaged a CLEC if the level of wholesale service qualify the vertically-integrated ILEC delivers to the CLEC is less than the quality the ILEC delivers to its own retail affiliate. Relevant dimensions of wholesale service quality include the speed with which an ILEC processes a CLEC's orders for key inputs, the frequency of errors committed by the ILEC in processing these orders, and the number of problems that arise with the inputs the CLEC purchases from the ILEC, for example. In many instances, an ILEC has been found to have served its own retail affiliate better than a CLEC on these and other dimensions of wholesale service quality, and the ILEC has been penalized accordingly. One might naturally interpret the incidence of these penalties as strong evidence that the ILEC has disadvantaged CLECs. This interpretation is recorded as Myth 5.

Myth 5. Persistent penalty payments by a VIP under a PMR plan are conclusive evidence that the VIP has disadvantaged rival CLECs.

Although persistent penalty payments under a PMR plan may constitute evidence that an ILEC has disadvantaged rival CLECs, the persistent payments do not necessarily do so. When the provision of wholesale service quality is unavoidably stochastic and when a PMR plan imposes penalties for inferior service quality but no corresponding rewards for superior service quality, an ILEC may persistently face financial penalties even when it provides the same (stochastic) wholesale service quality to CLECs that it provides to its retail affiliate. In essence, an asymmetric reward structure of this type records (and penalizes) failures, but does not record successes. Therefore, even when it achieves successes as frequently as (or even more frequently than) it incurs failures, ILEC may be judged to have "failed" under such an asymmetric PMR plan.[23] This observation underlies Fact 5.

Fact 5. A PMR plan may impose substantial penalties on a VIP even when the VIP provides the same (stochastic) wholesale service quality to retail competitors that it provides to its own retail affiliate.

[23] Wood and Sappington (2004) illustrate the magnitude of the penalties an ILEC can be forced to bear under a standard PMR plan even when it delivers the same stochastic quality to CLECs that it delivers to its own retail affiliate.

PMR plans of the type described above appear to reflect the belief that an ILEC is not disadvantaging a rival CLEC if the ILEC delivers the same level of service quality to the CLEC that it delivers to its own retail affiliate. This belief is recorded as the sixth and final myth.

Myth 6. A VIP cannot be disadvantaging a retail rival if the VIP consistently provides the same level of wholesale service quality to the rival that the VIP provides to its own retail affiliate.

Myth 6 is not a fact because identical levels of wholesale service quality can affect different retail competitors differently. If a CLEC uses a particular input more extensively than does an ILEC's retail affiliate, for example, the CLEC may suffer more than the ILEC affiliate from a given increase in the cost and/or decrease in the quality of the input.[24] In addition, if the regulated price of an input is set below its marginal cost of production, a vertically-integrated ILEC can experience increased wholesale profit when an identical diminution in wholesale service quality to all retail operators induces a reduction in the demand for the (unprofitable) wholesale service. Therefore, as Fact 6 suggests, ensuring that a VIP delivers identical levels of wholesale service quality to all retail operators (including the VIP's own retail affiliate) does not preclude the possibility that the VIP might be disadvantaging some retail competitors asymmetrically.

Fact 6. A VIP may be able to disadvantage a retail rival asymmetrically by: (1) reducing the wholesale service quality delivered to all retail operators (including its own retail affiliate) symmetrically; or (2) increasing the costs of all retail operators symmetrically.

6. Conclusions.

The primary purpose of this article was to illustrate why clear, simple, unequivocal policy recommendations can be difficult to draw in industries where vertically-integrated providers (VIPs) operate at multiple stages of production, as they do in today's telecommunications

[24] See Williamson (1968) and Sappington and Weisman (2005), for example.

industry, for example. A VIP that operates at multiple stages of production can have subtle and varied incentives that complicate the design of industry policy.

The discussion identified six economic myths:

Myth 1. TELRIC pricing of inputs is necessary to ensure efficient make-or-buy decisions.

Myth 2. If a VIP and a rival downstream competitor have equal bargaining power and if bargaining is costless, delegated input pricing will result in industry cost minimization and promote reasonable retail prices for consumers.

Myth 3. It is always advantageous for a VIP to raise the costs of its retail rivals.

Myth 4. It is always advantageous for a VIP to reduce the demand for the retail products of less-efficient retail rivals.

Myth 5. Persistent penalty payments by a VIP under a PMR plan are conclusive evidence that the VIP has disadvantaged rival CLECs.

Myth 6. A VIP cannot be disadvantaging a retail rival if the VIP consistently provides the same level of wholesale service quality to the rival that the VIP provides to its own retail affiliate.

The discussion explained why, despite their intuitive appeal, these myths are false. The discussion also reviewed the logic that underlies six corresponding economic facts:

Fact 1. An entrant's make-or-buy decision may be largely insensitive to the prices set for key inputs.

Fact 2. Even if they have equal bargaining power, a VIP and a retail competitor may employ the authority to negotiate input prices to establish high input prices that produce high retail prices.

Fact 3. A VIP may not wish to raise the costs of a downstream rival if the rival's downstream cost advantage is sufficiently pronounced.

Fact 4. Even under conditions that ensure a VIP would benefit financially from raising the operating costs of a retail rival, the VIP may not find it profitable to reduce the demand for the rival's products.

Fact 5. A PMR plan may impose substantial penalties on a VIP even when the VIP provides the same (stochastic) wholesale service quality to retail competitors that it provides to its own retail affiliate.

Fact 6. A VIP may be able to disadvantage a retail rival asymmetrically by: (1) reducing the wholesale service quality delivered to all retail operators (including its own retail affiliate) symmetrically; or (2) increasing the costs of all retail operators symmetrically.

Because seemingly-obvious facts can be myths in vertically-integrated industries, it is important to consider carefully all relevant incentives and actions when designing policy in these industries. Careful consideration can proceed along standard lines, assessing likely outcomes on the basis of relevant economic benefits and costs. However, the expanded set of relevant benefits and costs in vertically-integrated industries must be recognized explicitly. Most importantly, conclusions that have been established as facts in non-integrated settings should not simply be assumed to apply in vertically-integrated settings. Instead, the relevance of these "facts" should be reaffirmed, refuted, or qualified through careful, explicit analysis.

Two additional observations are presented in closing. First, the preceding discussion has taken as given the VIP's participation in multiple stages of production. In some settings, policymakers might contemplate precluding such participation. The potential benefits and costs of such restrictions in key industries like the telecommunications industry merit additional study.[25]

[25] See Vickers (1995), Crew et al. (2005), and Sappington (2005b), for example, for formal analyses of this issue.

Second, the preceding discussion has focused on settings where the VIP is the exclusive incumbent provider of essential upstream inputs. Competition among providers of key inputs may limit the ability of VIPs to disadvantage retail rivals, and may otherwise affect the incentives and abilities of VIPs. Such competition merits additional formal investigation.[26]

[26] See Beard et al. (2001) for one useful analysis of this important issue.

REFERENCES

Armstrong, Mark (1998) 'Network Interconnection in Telecommunications', *Economic Journal*, **108**, 545-564.

Armstrong, Mark (2001) 'Access Pricing, Bypass, and Universal Service', *American Economic Review*, **91(2)**, 297-301.

Armstrong, Mark (2002) 'The Theory of Access Pricing and Interconnection', in Martin Cave, Sumit Majumdar, and Ingo Vogelsang, eds., *Handbook of Telecommunications Economics*. Amsterdam: North-Holland Publishers, Chapter 8.

Armstrong, Mark, Simon Cowan, and John Vickers (1994) *Regulatory Reform: Economic Analysis and British Experience*. Cambridge, MA: The MIT Press.

Beard, T. Randolph, David Kaserman, and John Mayo (2001) 'Regulation, Vertical Integration, and Sabotage', *Journal of Industrial Economics*, **49(3)**, 319-333.

Brennan, Timothy (1997) 'Industry Parallel Interconnection Agreements', *Information Economics and Policy*, **9(2)**, 133-149.

Bulow, Jeremy, John Geanakoplos, and Paul Klemperer (1985) 'Multimarket Oligopoly: Strategic Substitutes and Complements', *Journal of Political Economy*, **93(3)**, 488-511.

Chen, Yongmin (2001) 'On Vertical Mergers and their Competitive Effects', *Rand Journal of Economics*, **32(4)**, 667-685.

Crew, Michael, Paul Kleindorfer, and John Sumpter (2005) 'Bringing Competition to Telecommunications by Divesting the RBOCs'**,** in Michael Crew and Menahem Spiegel, eds., *Obtaining the Best from Regulation and Competition***.** New York: Kluwer Academic Publishers, pp. 21-40.

Economides, Nicholas (1998) 'The Incentive for Non-Price Discrimination by an Input Monopolist', *International Journal of Industrial Organization*, **16**, 271-284.

Federal Communications Commission, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, CC Docket Nos. 96-98, 95-185, Released August 8, 1996.

Gilbert, Richard, and Michael Riordan (2005) 'Product Improvement and Technological Tying in a Winner-Take-All Market', Columbia University Working Paper.

Harbord, David, and Marco Ottaviani (2002) 'Anticompetitive Contracts in the UK Pay-TV Market', *European Competition Law Review*, **23(3)**.

Hotelling, Harold (1929) 'Stability in Competition', *Economic Journal*, **39(153)**, 41-57.

Laffont, Jean-Jacques, Patrick Rey, and Jean Tirole (1998a) 'Network Competition: I. Overview and Nondiscriminatory Pricing', *Rand Journal of Economics*, **29(1)**, 1-37.

Laffont, Jean-Jacques, Patrick Rey, and Jean Tirole (1998b) 'Network Competition: II. Price Discrimination', *Rand Journal of Economics*, **29(1)**, 38-56.

Mandy, David (2000) 'Killing the Goose that Laid the Golden Egg: Only the Data Know Whether Sabotage Pays', *Journal of Regulatory Economics*, **17(2)**, 157-172.

Mandy, David, and David Sappington (2005) 'Incentives for Sabotage in Vertically Related Industries', University of Missouri Working Paper.

Michigan Public Service Commission, *Opinion and Order* (Case No. U-11830) In the matter of Ameritech Michigan's submission on performance measurements, reporting, and benchmarks pursuant to the October 2, 1998 Order in Case No. U-11654, July 25, 2001.

Powell, Michael, 'Remarks at the National Association of Regulatory Commissioners General Assembly', March 10, 2004 (http://www.fcc.gov/commissioners/powell/mkp_speeches_2004.html).

Rosston, Gregory, and Roger Noll (2002) 'The Economics of the Supreme Court's Decision on Forward Looking Costs', *Review of Network Economics*, **1(2)**, 81-89.

Sappington, David (2005a) 'On the Irrelevance of Input Prices for Make-or-Buy Decisions', *American Economic Review*, forthcoming.

Sappington, David (2005b) 'On the Merits of Vertical Divestiture', University of Florida Working Paper.

Sappington, David, and Burcin Unel (2005) 'Privately-Negotiated Input Prices', *Journal of Regulatory Economics*, **27(3)**, 263-280.

Sappington, David, and Dennis Weisman (2005) 'Self-Sabotage', *Journal of Regulatory Economics*, **27(2)**, 155-176.

Salop, Steven and David Scheffman (1983) 'Raising Rivals' Costs', *American Economic Review*, **73(2)**, 267-271.

Salop, Steven and David Scheffman (1987) 'Cost-Raising Strategies', *Journal of Industrial Economics*, **36(1)**, 19-34.

Sibley, David, and Dennis Weisman (1998) 'Raising Rivals' Costs: The Entry of an Upstream Monopolist into Downstream Markets', *Information Economics and Policy*, **10(4)**, 451-470.

Vickers, John (1995) 'Competition and Regulation in Vertically Related Markets', *Review of Economic Studies*, **62(210)**, 1-17.

Weisman, Dennis (1995) 'Regulation and the Vertically Integrated Firm: The Case of RBOC Entry into InterLATA Long Distance', *Journal of Regulatory Economics*, **8(3)**, 249-266.

Williamson, Oliver (1968) 'Wage Rates as a Barrier to Entry: The Pennington Case in Perspective', *Quarterly Journal of Economics*, **82(1)**, 85-116.

Wood, Lisa, and David Sappington (2004) 'On the Design of Performance Measurement Plans in the Telecommunications Industry', *Telecommunications Policy*, **28(11)**, 801-820.

Wright, Julian (2002) 'Access Pricing Under Competition', *Journal of Industrial Economics*, **50(3)**, 289-316.

Wright, Julian (2004) 'One-sided Logic in Two-sided Markets', *Review of Network Economics*, **3(1)**, 42-63.