Are Regulators Forward-Looking? The Market Price of Copper Versus the Regulated Price of Mandatory Access to Unbundled Local Loops in Telecommunications Networks

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I. INTRODUCTION

Beginning in 1996, regulators in virtually every industrialized nation started down the path of mandating that the incumbent telecommunications operator offer competitors access to its network at regulated prices that reflect the forward-looking cost of the network, rather than the incumbent's historic cost. In the United States, the Telecommunications Act of 1996 requires that incumbent local exchange carriers (ILECs) provide certain elements of their networks to competitive local exchange carriers (CLECs).[1] Most prominent among these elements is the local loop (the connection between a subscriber and a telephone company's local switch).

The Telecommunications Act requires that these network elements be priced at cost, with the possible addition of a reasonable profit.[2] In August 1996, the Federal Communications Commission (FCC) issued rules for determining these prices.[3] The agency invented the concept of total element long-run incremental cost (TELRIC) and made it the foundation for the rules for pricing mandatory access to unbundled network elements. The

1. Telecommunications Act of 1996 tit. I, § 101(a), 47 U.S.C. §§ 251-52 (2000).

2. *Id.* at § 252(d)(1).

3. Implementation of the Local Competition Provisions in the Telecommunications Act of 1996; Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, *First Report and Order*, 11 F.C.C.R. 15499 (1996) [hereinafter *First Report and Order*].

FCC's rules were based on a model of a hypothetical carrier that places switches in the ILEC's existing switch locations but otherwise builds an entirely new network to serve customer locations: "[t]he total element long-run incremental cost of an element should be measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers."[4] The FCC's objective in establishing this rule was unexceptionable: to determine the "incremental costs that incumbents actually expect to incur in making network elements available to new entrants"[5] and to adopt a pricing methodology that "best replicates, to the extent possible, the conditions of a competitive market."[6]

To say that the FCC's pricing rules proved to be controversial both in theory and practice would be an understatement.[7] Between 1999 and 2002, the Supreme Court twice interpreted the rules for mandatory unbundling[8] and thereafter issued two more decisions in 2004 and 2007 construing the relationship of antitrust law to this new regulatory regime.[9] Much of the theoretical debate has focused on establishing proper cost of capital and depreciation values that reflect the risk facing firms owning substantial amounts of capital assets that become sunk upon deployment.[10] Certain

4. 47 C.F.R. § 51.505(b)(1) (2008).

5. *First Report and Order, supra* note 3, at para. 685.

6. *Id.* at para. 679.

7. Indeed, as we explain in more detail below, although the U.S. Supreme Court in 2002 ultimately upheld the FCC's authority to establish the TELRIC rules, in 2003, the FCC opened an investigation to reform those rules to (1) make them align more realistically with the underlying costs that telecommunications networks entail and (2) better promote facilities-based competition. *See* Pricing of Unbundled Network Elements and the Resale of Services by Incumbent Local Exchange Carriers, *Notice of Proposed Rulemaking*, 18 F.C.C.R. 18945 (2003).

8. For a detailed critique of the FCC's pricing of unbundled network elements in the *First Report and Order*, *see* J. Gregory Sidak & Daniel F. Spulber, *The Tragedy of the Telecommons: Government Pricing of Unbundled Network Elements Under the Telecommunications Act of 1996*, 97 COLUM. L. REV. 1081 (1997). These pricing rules, along with numerous other parts of the FCC's interconnection rules, were almost immediately challenged by ILECs and a number of state regulators. In July 1997, the U.S. Court of Appeals for the Eighth Circuit overturned the FCC's pricing rules on the grounds that the states, rather than the FCC, had jurisdiction over pricing. Iowa Utils. Bd. v. FCC, 120 F.3d 753, 794-96 (8th Cir. 1997). In January 1999, the Supreme Court modified the Eighth Circuit's decision, upholding the FCC's authority to establish pricing rules (which are implemented by the states), but not ruling on the merits of the rules themselves. AT&T Corp. v. Iowa Utils. Bd., 525 U.S. 366, 368 (1999). In May 2002, the Court ultimately ruled that the FCC's pricing approach was a lawful interpretation of the (ambiguous) pricing provisions for unbundled network elements contained in the Telecommunications Act. Verizon Comm. Inc. v. FCC, 535 U.S. 467, 468 (2002).

9. Verizon Comm. Inc. v. Law Offices of Curtis V. Trinko, 540 U.S. 398 (2004); Bell Atlantic Corp. v. Twombly, 127 S. Ct. 1955 (2007).

10. *See* Jerry A. Hausman, *Regulated Costs and Prices in Telecommunications*, *in* 2 EMERGING TELECOMMUNICATIONS NETWORKS: THE INTERNATIONAL HANDBOOK OF

components of modern telecommunications networks typically experience steady decreases in equipment prices because of technological progress. For example, the network operator usually can replace a switch or a piece of fiber optic electronic equipment for less than its original purchase price, yet maintain comparable quality and capabilities. The theoretical literature explains how levelized annual cost calculations, widely used by U.S. regulators, can produce economically incorrect cost estimates in these circumstances.

This article describes another potential source of error in estimating the economic costs of network elements—an error that, despite its great practical significance, has elicited no commentary and evidently has caught regulators around the world unaware. The cost models that regulators use in practice typically require detailed estimates of the equipment and installation prices of the numerous components that are used in a telecommunications network. To represent and estimate the cost of local loop facilities, these models estimate the quantities of components—such as miles or kilometers of copper cable—as well as the purchase and installation prices for these components. Consequently, when there is uncertainty about how these prices will change over the period for which costs and prices are required, the resulting cost estimates used for setting the regulated prices of unbundled network elements can be very inaccurate.[11] Similarly, when regulators in other jurisdictions are considering such rates as "benchmarks," it is necessary to make adjustments to account for such large differences in critical input prices so that the benchmark rates will be representative of the costs that will be incurred by efficient carriers offering unbundled elements in those jurisdictions.

The precipitous rise in the price of copper since 2003 exemplifies this need to reevaluate the inputs used by regulators in their cost model, as well as the inferences drawn from those models.[12] The large increases in copper

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TELECOMMUNICATIONS ECONOMICS, 199 (Gary Madden ed., 2003); Jerry A. Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications, in* BROOKINGS PAPERS ON ECONOMIC ACTIVITY, MICROECONOMICS: 1997, 1 (Clifford Winston et al. eds., 1997); Jerry A. Hausman & J. Gregory Sidak, *Did Mandatory Unbundling Achieve Its Purpose? Empirical Evidence from Five Countries,* 1 J. COMPETITION L. & ECON. 173, 195 (2005); Jerry A. Hausman & J. Gregory Sidak, *A Consumer-Welfare Approach to Mandatory Unbundling of Telecommunications Networks,* 109 YALE L.J. 417, 462-63 (1999); Robert Pindyck, *Mandatory Unbundling and Irreversible Investment in Telecom Networks,* 6 REV. NETWORK ECON. 274, 274-75 (2007).

11. Typically, the cost models used in regulatory proceedings essentially ignore such potential outcomes and instead implicitly assume that input prices will remain the same for the foreseeable future.

12. *See, e.g.*, Clifford Krauss, *Commodities' Relentless Surge*, N.Y. TIMES, Jan. 15, 2008, at C1 ("The price of copper has tripled in five years. . . . The biggest single factor increasing commodity prices is China's rush to construct factories, other buildings and roads

prices differ from the type of constant annual expected input price growth (or decline) situation that some cost models used outside the United States have accommodated with "tilted annuity" methods. Rather than a gradual anticipated price increase, copper prices escalated rapidly and are likely to remain well above the levels that regulators used to set existing loop rates.

The global financial crisis that began in the summer of 2008 does not change the fundamental point that we raise. The price of copper fell sharply in mid-2008; yet, as of this writing, that price is still roughly *twice* the level that is built into the regulatory models. Indeed, this wide fluctuation in the price of copper demonstrates why the use of a fictitious network with current prices introduces a great amount of variability into the prices. Should a regulator change regulated rates each time the price of copper changes? Can a network provider or access seeker do rational business planning when facing this amount of variability?

Part II of this article explains the data that TELRIC models require if they are to achieve their purpose of producing valid estimates of the forward-looking cost of an efficient telecommunications network. Part III documents the rapid rise in copper prices since 2003 and how accounting for such evidence would change the forward-looking costs of a hypothetically efficient ILEC network that one of the most prominent U.S. state regulatory commissions—the California Public Utilities Commission (CPUC)—established in 2006.[13] Part IV explains how the Commerce Commission in New Zealand has similarly employed a benchmarking methodology for the pricing of unbundled loops that fails to account for the increased price of copper.[14]

Part V asks whether a global trend is emerging among telecommunications regulators to ignore the input requirements of their own forward-looking cost models. Such a trend would be consistent with a version of regulatory opportunism in which regulators are forward-looking only when doing so produces lower regulated prices over time. The risk of

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to satisfy a growing, increasingly middle-class urban population with a taste for cars and other consumer goods.").

13. Establishing Unbundled Network Element Rates and Price Floors for Verizon California, Rulemaking 93-04-003, Decision 06-03-025 (Cal. Pub. Util. Comm'n Mar. 15, 2006), *available at* http://docs.cpuc.ca.gov/published/Final_decision/54579.htm [hereinafter *Decision 06-03-025*]. Because of the time taken to render the decision, the circa 2003 evidentiary record for copper cable prices had been outdated by the rapid increase in prices that followed.

14. Draft Standard Terms Determination for the Designated Service Telecom's Unbundled Copper Local Loop Network, Decision 609 (N.Z. Commerce Comm'n proposed July 31, 2007) [hereinafter *Initial Decision 609*], *replaced by* Standard Terms Determination for the Designated Service Telecom's Unbundled Copper Local Loop Network Backhaul (Telephone Exchange to Interconnect Point), Decision 626 (N.Z. Commerce Comm'n June 27, 2008).

regulatory opportunism and the high price of copper together create a strong incentive for an ILEC to replace its copper loops with optical fiber. Although some CLECs could be adversely affected by such a decommissioning of copper loops, an ILEC has no duty under U.S. antitrust or telecommunications law to keep copper loops in service for the benefit of its competitors.

II. THE DATA REQUIREMENTS FOR FORWARD-LOOKING COST MODELS

To attain the FCC's objective for TELRIC of determining "incremental costs that incumbents actually expect to incur in making network elements available to new entrants,"[15] the results produced by the TELRIC process must be consistent with the forward-looking business decisions that those incumbents make in designing the network that produces both the network elements provided on a wholesale basis and the incumbent's retail services.[16] In competitive markets, such investments are made with the expectation that prices will be sufficient to recover the investments in long-lived assets (typically with "lumpy" capacities over their economic lifetime) to earn a normal return, and to recover the associated direct expenses along with some portion of the joint and common costs of the enterprise.[17] The competitive prices that are the basis for such decisions are also the economically efficient rates for any unbundled elements provided to other carriers.

Accordingly, evaluating whether the results produced by TELRIC approximate such efficient prices involves an assessment of the extent to which the TELRIC assumptions that constrain the network design to existing switch locations—but otherwise assume that the network operator has complete freedom to design a new network instantaneously—depart from the economic decisions that produce real networks. In fact, previous

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15. *First Report and Order, supra* note 3, at para. 685.
16. *Id.* at para. 679.
17. In particular, Baumol and Sidak observe:

> In recovering the cost of a lumpy plant over its lifetime, the payments should be timed as they are in any competitive market. Thus, the sum of the revenues over the lifetime of the investment should be sufficient to cover all costs, including replacement of the investment when the time arrives, and the cost of the capital tied up in the investment during its lifetime. This fundamental relationship means that the discounted present value of these revenues must constitute a sum equal to the discounted present value of the costs. The timing of the realization of these revenues, however, cannot be determined definitively by the regulatory agency—or by the courts or the firm's management, for that matter. The timing ultimately is affected, if not entirely determined, by the state of the market at different periods during the lifetime of the investment.

William J. Baumol & J. Gregory Sidak, *The Pig in the Python: Is Lumpy Capacity Investment Used and Useful?*, 23 ENERGY L.J. 383, 389-90 (2002).

analyses have identified at least two significant ways in which the TELRIC process departs from reality.[18]

First, because of the long lives of network assets and the fact that demand can change over both space and time, network components are built over time, not instantaneously. Second, investments in assets with long lives are made in the face of uncertainty about output prices and volumes, input prices, and interest rates. Therefore, these departures from reality imply that the costs and rates produced by the TELRIC process will differ—potentially substantially—from economic costs and prices.[19]

A simple example of the bias introduced by the first factor is that the routing of loop facilities from switches to customer locations is very likely longer in the real world than what typical cost models based on TELRIC produce, because the network was built to accommodate customer locations as they evolved (e.g., to new subdivisions of housing) rather than instantaneously.[20] As a result, real routes would require more cables and

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18. *See, e.g.,* J. Gregory Sidak & Daniel F. Spulber, DEREGULATORY TAKINGS AND THE REGULATORY CONTRACT: THE COMPETITIVE TRANSFORMATION OF NETWORK INDUSTRIES IN THE UNITED STATES 403-26 (1997); Graeme Guthrie, *Regulating Infrastructure: The Impact on Risk and Investment*, 44 J. ECON. LIT. 925 (2006); Hausman, *Regulated Costs and Prices in Telecommunications*, *supra* note 10; Timothy J. Tardiff, *Pricing Unbundled Network Elements and the FCC's TELRIC Rule: Economic and Modeling Issues*, 1 REV. NETWORK ECON. 132 (2002).

19. For example, Lehman and Weisman ask how much such hypothetical costs differ from embedded costs—the actual operating costs to run a network of varying vintages of equipment, valued at the prices paid for equipment when purchased. DALE E. LEHMAN & DENNIS WEISMAN, THE TELECOMMUNICATIONS ACT OF 1996: THE "COSTS" OF MANAGED COMPETITION (2000). Based on simulations of embedded and hypothetical costs over a long-run period, they produce ranges within which cost differences should fall. The ranges that they produce are generally smaller than the differences between embedded costs and rates adopted by regulators, suggesting that other factors (e.g., inputs such as equipment prices, cost of capital, and depreciation rates) explain the generally lower levels of unbundled network element (UNE) rates that regulators adopt. There is one special case under which the TELRIC assumptions could overstate costs (apart from using upwardly biased input prices). If the price of an asset is expected to increase over time (e.g., at 2% annually), then properly representing economic depreciation will result in costs that are lower than those produced by TELRIC's implicit assumption of constant input prices in the early years, but higher prices later. *See, e.g.*, David M. Mandy & William W. Sharkey, *Dynamic Pricing and Investment from Static Proxy Models*, 2 REV. NETWORK ECON. 403 (2003). Such an effect would be offset by the cost increases associated with accommodating uncertainty.

20. In fact, the FCC acknowledged that its original conception of TELRIC is likely to be unrealistic in this regard when it tentatively concluded in 2003 that TELRIC should be revised to "more closely account for the real-world attributes of the routing and topography of an incumbent's network in the development of forward-looking costs." Pricing of Unbundled Network Elements and Resale of Service by Incumbent Local Exchange Carriers, *Notice of Proposed Rulemaking*, 18 F.C.C.R. 18945, para. 52 (Sept. 15, 2003). Although the FCC announced this conclusion in 2003, as of October 2007, the agency had yet to complete its proceeding on the reform of the TELRIC process. Consequently, as of late 2008, it remains the case that U.S. unbundled element prices are still based on flaws that the FCC considers serious enough to require fixing.

support structures because of their greater length.[21] Hausman[22] and Pindyck[23] have identified the downward biases associated with the fact that TELRIC models ignore the uncertainty under which real network investments are made. A consequence of these biases is that the TELRIC process will likely produce regulated rates for network elements that are lower than economic costs, even when all input prices are measured correctly.

III. Copper Prices and the California Public Utilities Commission

In a recent proceeding in California to establish prices for unbundled local loops, a witness for CLECs intending to lease local loops and other unbundled network elements observed that copper prices had declined by 31% between the passage of the Telecommunications Act in 1996 and the end of 2002.[24] The implication was that the cost of local loops, for which copper cables are a substantial component, should be expected to decrease as well. In fact, the California Public Utilities Commission (CPUC) approved new local loop rates in March 2006 using copper cable inputs from 2003.[25] Those 2003 prices turn out to be the *low point* of recent copper prices, as shown in Figure 1.[26] Even after the sharp decline in copper prices in mid-2008, those prices were still substantially higher than prices in 2003.

21. The shorter distance in a TELRIC model can be viewed as an artificial efficiency improvement. That is, the "production process" implied by TELRIC produces the same outputs (such as loops to customer locations) with fewer inputs. In principle, these artificial efficiencies could be mitigated by using higher rates of economic depreciation, but this adjustment would be difficult to implement in practice. Similarly, TELRIC models understate costs to the extent that they fail to anticipate that future regulatory proceedings may produce even lower rates, based on even more "efficient" hypothetical networks. *See* Guthrie, *supra* note 18, at 936.

22. Hausman, *Regulated Costs and Prices in Telecommunications*, *supra* note 10.

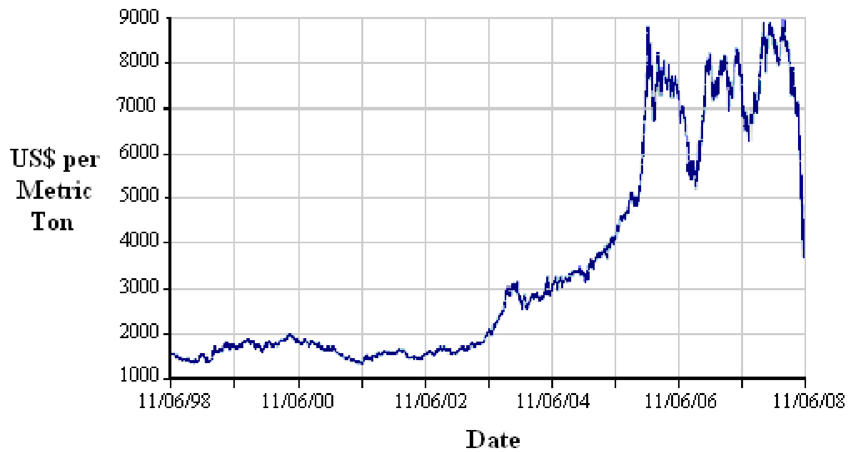
23. Pindyck, *supra* note 10.

24. Declaration of John C. Klick in Support of Opening Comments of Joint Commentors at para. 22, Open Access and Network Architecture Development of Dominant Carrier Networks, Invest. 93-04-002 (Cal. Pub. Util. Comm'n Nov. 3, 2003) (on file with the *Federal Communications Law Journal).*

25. *Decision 06-03-025*, *supra* note 13.

26. Prices for November 6, 1998 through November 6, 2008 are Copper Grade A cash buyer prices reported by LME. *See* London Metal Exchange, Copper, Price graphs, http://www.lme.co.uk/copper_graphs.asp (last visited Nov. 23, 2008).

Figure 1: Copper Prices



Contrary to the suggestion that copper prices were on a constant downward trend, which would justify lower local loop prices in future years, copper price almost immediately began to increase in 2003, and by late 2007 were *more than four times* their 2003 level. Such an increase would have a noticeable impact on the regulated rate for an unbundled local loop.

Adjusting previously calculated unbundled element costs and rates for major changes in input prices proceeds as follows. In the United States, models that have been used to produce costs and rates for unbundled local loops typically depict such loops as consisting of the following basic components: (1) a copper drop wire (and associated equipment at the customer's end of the loop); (2) copper distribution cable connecting the drop wire to a cross-connect facility; (3) fiber or copper cable between the cross-connect and the telephone company's switch; (4) for fiber-fed loops, electronics that convert analog into digital signals; (5) support structures, such as telephone poles and buried trenches over which cables are routed; and (6) installation labor.

These cost models derive unit costs by: (1) estimating the quantities of equipment needed to serve end users (e.g., lengths of copper cables of various sizes, number of telephone poles, etc.) as well as the associated labor cost for installing that equipment; (2) deriving the total investment associated with the equipment and its installation by multiplying quantities by current unit input prices (e.g., the price per foot for 25-pair copper cable); (3) converting investments into annual (or monthly) capital costs necessary to recover the initial investments, pay the associated income taxes, and earn a return on those investments over the economic lives of the assets; (4) adding the annual direct costs (e.g., maintenance) and some portion of shared and common costs; and (5) dividing the result by the number of units expected to be in service.

In the case of unbundled loops, if the price of a particular input changes and the other prices remain constant, the resulting change in the output price can be approximated as follows:

$$ALC = OLC \times \left((1 - w) + w \frac{P_N}{P_O} \right)$$

where *ALC* is the adjusted loop cost that results from the change in the input price, *OLC* is the original loop cost, w is the proportion of total cost accounted for by the input whose price has changed, P_O is the input price used to determine the original loop cost, and P_N is the current price of the input in question. This approximation ignores the possibility that, if a particular input becomes more expensive, there may be some substitution toward other inputs. For example, if the price of copper increases, it may become economic to deploy more fiber in the feeder. In the particular California outcome discussed (the effect of the quadrupling of copper prices on unbundled loop costs and rates), this substitution effect is small. Even at the lower prices, the model in question depicted a predominantly fiber-fed network. Therefore, copper feeder accounts for very little of the total investment in the loop.

Returning to the recent California example, copper cable accounted for about 12% to 13% of total loop costs in the CPUC's calculations. Therefore, increasing copper cable input prices by the factor of 4.4, the amount that the spot market price for copper increased between June 2003 and June 2006, would increase the loop cost by a factor of 0.12 to 0.13 × (4.4 – 1), or about 40% from US$14 to about US$19 to US$20.[27] This estimate assumes that the increase in the price of raw copper passes through directly into the price of copper cable.[28]

27. Ideally, consistent with *AT&T Communications of Illinois v. Illinois Bell Telephone Co.*, 349 F.3d 402 (7th Cir. 2003), had the CPUC chosen to update copper input prices, other prices, such as depreciation and the cost of capital, would be updated to 2006 values as well. However, because the very large increase in copper prices is very likely much larger in magnitude than potential offsetting factors that would lower the loop cost, the loop costs adopted by the CPUC were most likely immediately out-of-date and, consequently, would no longer serve as a reliable benchmark for loop costs in other jurisdictions. *Decision 06-03-025*, *supra* note 13.

28. For example, if the price of copper cable reflects other aspects of transforming raw copper into ready-to-install cable (e.g., production, warehousing, and the like), then the cost increase could differ from the trend in raw copper prices. If the price of cable increased by a factor of 2.5 (rather than the 4.4 increase in the copper spot price), the change in the loop price would be 0.12 to 0.13 x (2.5 – 1), or 18% to 20%.

IV. COPPER PRICES AND THE NEW ZEALAND COMMERCE COMMISSION

Although the record evidence upon which the CPUC's March 2006 decision did not account for the sharp increases in the market price of copper in its forward-looking pricing of local loop unbundling (LLU), the New Zealand Commerce Commission was explicitly presented and erroneously ignored such evidence in 2007. To understand how the Commerce Commission made that mistake, it is useful to examine first its benchmarking methodology for setting prices for unbundled local loops.

A. *Biased LLU Benchmark Estimates*

In this section, we will assume that the Commerce Commission's analysis is based on valid forward-looking data. The Commerce Commission attempts to solve a well-posed problem in econometrics: given the characteristics of local loops in New Zealand, what is the best prediction using the available overseas data? Econometrics (or, more generally, statistics) has developed a well-accepted procedure to answer this question. Prediction based on a linear regression model, given the local loop characteristics in question, yields the best linear unbiased predictor (BLUP). Thus, if the models are restricted to be linear and unbiased, prediction from a regression model is "best" in the sense that it minimizes the variance of the prediction.[29] Econometricians typically limit consideration to consistent unbiased estimation procedures because unbiasedness means that the prediction has an expected error of zero. The BLUP result follows directly from the Gauss-Markov theorem, the fundamental theorem of regression, which has been known for over a century.[30] Thus, the correct procedure for the Commerce Commission to employ in a benchmark approach is to estimate a regression model and use it to predict the LLU prices, given the characteristics of local loops in New Zealand or the particular geographic region in question.

However, the approach that the Commerce Commission used to develop benchmark rates did not follow this correct approach. Instead, the Commerce Commission used a series of bivariate analyses of "potential comparators" to determine "the relationship between each particular indicator and UCLL [unbundled copper local loop] rates."[31] This approach leads to biased results because each bivariate regression suffers from the omitted variable problem.

29. Of course, nonlinear transformations of the variables all fit within this category, although sometimes consistency replaces unbiasedness.

30. *See, e.g.*, HENRI THEIL, PRINCIPLES OF ECONOMETRICS 119, 124 (1971).

31. *Initial Decision 609*, *supra* note 14, at 97.

Two examples demonstrate the omitted variable problem. Suppose one wanted to predict the performance of an incoming student to the MIT graduate economics program. If one used a bivariate regression of actual student performance and the student's score on the Graduate Record Exam (GRE) economics section, one would find a positive relationship. However, if instead, one used a multivariate regression model and included undergraduate grade point average, performance on the GRE math exam, and performance on the GRE economics exam, one would find no significant relationship between the GRE economics exam score and performance in the MIT graduate economics program. Indeed, MIT economics admission disregards this variable—performance on the GRE economics exam. If the other two variables are omitted, the GRE economics exam result is found to be important, but that is because it is positively correlated with the other two omitted variables. Conversely, if one used a bivariate relationship to consider the effect of performance on the GRE English exam on graduate student performance, one likely would not find a relationship. However, if one included performance on the GRE English exam with grade point average and performance on the GRE math exam, one would likely find a positive and significant relationship. Thus, using bivariate regression models leads to both kinds of errors: finding a variable to be important when it is not important in a multivariate relationship and finding a variable not to be important when it is important in a multivariate relationship.

The Commerce Commission's approach for determining benchmark rates is to consider a number of demographic and economic factors that may be significant determinants of local loop costs so that they are reflected in LLU rates. The Commerce Commission carried out a bivariate regression analysis "to determine the relationship between each individual comparability indicator and local loop rates."[32] This bivariate regression analysis identified urban population and, less strongly, teledensity and population density.[33] These three variables were then used "to identify countries comparable to New Zealand."[34] An arbitrary range for each of the three variables was used to choose a sample of seven U.S. states, and Australia, Finland, Norway, and Sweden, for a total of eleven sample observations. After converting the rates to New Zealand dollars, the Commerce Commission used the median of the eleven observations of

32. *Id.* at 24.
33. *Id.*
34. *Id.* at 25.

NZ$20.77.[35] If the average was used instead, it would increase to NZ$21.48.[36]

Taking a median (similar to an average) is an incorrect econometric procedure. Only if the eleven observations were a random sample from a population similar to New Zealand would unbiased results occur. However, a table in the Commerce Commission's decisions strongly suggests that the sample used violated this criterion.[37] The median (and mean) of urban population in the Commerce Commission data is 0.77, while for New Zealand the urban population variable is 0.86.[38] Because the Commerce Commission found urban population to be the most important variable, the Commerce Commission's approach is likely to generate a biased estimate of LLU rates.

Sidak and Singer, whom the Commerce Commission references, criticize the Irish regulator for using the mean of EU countries to set Ireland's benchmark LLU rates.[39] Sidak and Singer recommend using a regression model as a superior approach to taking the sample mean.[40] In Ireland, they found a downward bias of 42% because the regulator used the sample average rather than the regression model prediction.[41]

B. Long-Term Benefits to End Users and Distortion of Investment Incentives

Before turning to a regression analysis, we briefly examine the Commerce Commission's consideration with regard to the criterion of long-term benefits to end users. We do not agree with the economic analysis underlying the decision. We begin with the observation that in Canada and in many U.S. states, including California and a number of other large states, local telephone rates have been deregulated (and/or subject to much less stringent price controls)since 2006 or 2007.[42] These jurisdictions determined that deregulation was appropriate when cable-television-based

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35. *Id.* at 30, tbl.6.

36. *Id.*

37. *Id.* at 25, tbl.4.

38. The medians and means of the other two variables, teledensity and population density, are relatively close. *Id.* at 25, tbl.4.

39. *Id.* at 23 (citing J. Gregory Sidak & Hal J. Singer, *How Can Regulators Set Non-Arbitrary Interim Rates? The Case of Local Loop Unbundling in Ireland*, 3 J. NETWORK INDUS. 273 (2002)).

40. Sidak & Singer, *supra* note 39, at 289.

41. *Id.* at 289-90.

42. For a discussion, see Jerry A. Hausman & J. Gregory Sidak, *Telecommunications Regulation: Current Approaches with the End in Sight*, *in* ECONOMIC REGULATION AND ITS REFORM: WHAT HAVE WE LEARNED? (Nancy L. Rose, ed., forthcoming 2008), *available at* http://www.nber.org/books_in_progress/econ-reg/index.html.

telephone service and cellular service competed with the landline carrier's service.

Most economists agree that competition, rather than "regulation forever," leads to better results for consumers. Thus, when the Commerce Commission considers "additional incentives for access seekers to replicate and bypass Telecom's local loop infrastructure" they are mistakenly considering that an access seeker might decide to build a new copper-based network.[43] This outcome probably would never happen. The relevant question is how low access rates affect the economic incentives to invest in alternative technologies—e.g., a pay cable network that will compete with the landline network or new technologies such as WiMax.[44]

Our academic research has determined that low LLU rates decrease economic incentives for investment in alternative competing technologies.[45] Further, because LLU rates do not correctly account for the sunk and irreversible nature of network investment, they are too low to create incentives for efficient investment.[46] Because investors in competing technologies (such as cable networks or WiMax networks) will be required to take account of the sunk and irreversible nature of network investment, the Commerce Commission's claim of possible "inefficient by-pass" is incorrect.[47] The Commerce Commission needs to consider competitive outcomes in Canada and the United States as well as the investment incentives and investment risks faced by potential competing network providers in New Zealand.

Our previous research has also demonstrated that the incumbent's investment is determined by its expected rate of return. This fact is especially important in the current situation because most new investment in telecommunications networks is sunk and irreversible. Indeed, the U.S. experience demonstrates that the incumbents decided to invest in residential fiber-optic networks once the FCC guaranteed that it would not mandate that competitors have access to these new networks at uneconomic rates artificially suppressed by regulation. Currently, Verizon and AT&T

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43. *Initial Decision 609*, *supra* note 14, at 28-29.

44. Sprint is currently building a WiMax network in the United States. *See, e.g.,* Press Release, Sprint Nextel and Samsung Electronics Corporation Ltd., Sprint and Samsung Declare Mobile WiMax Technology Is Now Ready For Commercial Service (May 15, 2008), *available at* http://www2.sprint.com/mr/mrhome.do (follow "News Releases" hyperlink, then follow hyperlink dated May 15, 2008).

45. *See, e.g.*, Hausman & Sidak, *Did Mandatory Unbundling Achieve Its Purpose?*, *supra* note 10.

46. *See*, *e.g.*, Hausman, *Regulated Costs and Prices in Telecommunications*, *supra* note 10. We have discussed this point in numerous academic papers, and it has been accepted by the FCC. *See First Report and Order*, *supra* note 3, at para. 687.

47. *Initial Decision 609*, *supra* note 14, at 29-32.

are investing in these new networks at a cost exceeding US$10 billion.[48] Thus, to the extent that New Zealand will depend on its own incumbent, Telecom New Zealand, to provide new technology requiring new investment, it is important that the Commerce Commission—if it does not forbear from mandating access to new networks entirely—establish regulated rates for mandatory access that make this investment economic in the sense of having a high enough expected rate of return.

C. Benchmark Rates Predicted from a Regression Model

We now estimate a regression model where the left-hand side variable is the logarithm (log) of price and the right-hand side variables are log of population density, log of urban population, and log of teledensity. We do not argue that this regression model should be used to determine LLU benchmark prices, as the rates used in the model are not forward-looking. Rather, the value of the model is to demonstrate the downward bias in the Commerce Commission's approach.

Our first sample has 51 observations from U.S. states (and the District of Columbia) that are contained in the Commerce Commission database. We begin with U.S. states because they share a common technology arising from the Bell System before 1984 and from Bellcore thereafter. The results appear in Table 1.

Table 1: Log Regression Model: U.S. States

ln_llu_nz	Coef.	Std. Err.	T	P>|t|
ln_popdensity	-0.056	0.023	-2.43	0.02
ln_urbanpop	-0.229	0.083	-2.75	0.01
ln_teledensity	-0.089	0.077	-1.15	0.26
_cons	3.203	0.154	20.77	0.00
Number of obs.	51.000			
R-squared	0.581			
Root MSE	0.147			

48. Despite the fact that U.S. incumbents continue to make unbundled copper loops available (or the equivalent functionality on fiber loops) after such upgrades are complete, a number of competitors have requested that the FCC and U.S. state regulators not allow incumbents to retire copper facilities. Such a perpetuation of copper facilities (especially if unbundled loop prices have not been updated to reflect recent developments in world copper markets) would harm the incentives of both incumbents and providers of competing platforms to invest.

Table 1 indicates that population density and urban population are highly significant and that teledensity has the expected sign.[49] The root mean squared error (MSE) is 14.7%, and the R^2 is 0.58; so the model has good properties. Using the values for New Zealand given by the Commerce Commission,[50] the regression model predicts a median of NZ$23.61 with a standard error prediction of 15.3%. This prediction is unbiased and is 13.7% higher than the Commerce Commission's median result.[51] Thus, we conclude that the Commerce Commission's median rate is downwardly biased by a statistically significant amount (at the 10% level).

We now consider another regression model that includes all the U.S. states as well as the four additional countries used in the Commerce Commission's analysis: Australia, Finland, Norway, and Sweden. The results appear in Table 2.

Table 2: Log Regression Model: U.S. States Plus Australia, Finland, Norway, and Sweden

ln_llu_nz	Coef.	Std. Err.	t	P>|t|
ln_popdensity	-0.031	0.020	-1.52	0.13
ln_urbanpop	-0.303	0.078	-3.88	0.00
ln_teledensity	-0.154	0.075	-2.05	0.05
_cons	3.013	0.133	22.71	0.00
Number of obs	55.000			
R-squared	0.548			
Root MSE	0.154			

The model does not fit quite as well as the previous model, as the root MSE increases to 15.4%. Teledensity now becomes significant, while population density is no longer significant. The median prediction for New Zealand is now NZ$22.31, which is 7.4% higher than the Commerce Commission's prediction.[52] This result again demonstrates the bias in the Commerce Commission's econometric approach. The standard error of the prediction is 15.8%, which again demonstrates that the regression model prediction has excellent properties.

We conclude that the Commerce Commission's approach to estimating benchmark LLU rates for New Zealand does not follow accepted econometric practice. Further, a regression model is able to give quite precise predictions for New Zealand based on a sample of U.S. states plus the foreign countries used by the Commerce Commission. The results

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49. Although teledensity is not individually significant, it improves the predictive power of the model.

50. *Initial Decision 609*, *supra* note 14, tbl.3.

51. *Id.* at 31, tbl.6.

52. *Id.*

of the regression model demonstrate a downward bias in the Commerce Commission's results, as Table 3 summarizes.

Table 3: Commerce Commission Estimate and Regression Estimates

Source of Estimate	Median	% Bias of Commerce Commission Est.
CC Median Estimate	$20.77	---
Regression Model U.S. States	$23.61	13.7%
Regression Model: U.S. + Foreign	$22.31	7.4%

D. Benchmark Data That Are Not Forward-Looking

The Commerce Commission states that the LLU rates should be forward-looking.[53] We agree. However, the data used by the Commerce Commission to set benchmark rates are not forward-looking. Between 2001 and 2007, the price of copper increased by approximately 343%—from US$1,578 per metric ton in 2001 to US$6,985 in 2007.[54] Although one of the most significant costs of a local loop is the copper cable, this increased price of copper is not reflected in the data upon which the Commerce Commission relied. In this respect, the Commerce Commission's benchmark data are not forward-looking, and that data consequently causes downward bias in estimates of the forward-looking LLU price. Our unbiased median estimate of the correct LLU price for New Zealand is NZ$32.78, which is forward-looking because it takes account of the increased price of copper. The Commerce Commission's estimate is not forward-looking because it does not account for the increased price of copper. Table 4 shows the LME yearly copper price from 2001 to 2007.

Table 4: Price of Copper, 2001-2007 (US$ per Metric Ton)

Year	Price	% Increase from 2001
2001	1,577.56	
2002	1,557.88	-1.2%
2003	1,779.73	12.8%
2004	2,867.96	81.8%
2005	3,683.81	133.5%
2006	6,725.33	326.3%
2006	6,985.22	342.8%
Source: London Metal Exchange, series LCPCASH~US$.		

53. *Id.* at 20-21.
54. Data contained in tbl.4.

Because copper is a storable commodity, the current spot price is an excellent estimate for the expected future price. Thus, no reason exists to believe that the copper price will return to "normal" lower levels in the future. It would be incorrect to take a long-run average for the copper price given the economic factors that determine the price of copper. Even though New Zealand's exchange rate may be subject to cyclical volatility, no reason exists to believe that the world price of copper is subject to cyclical volatility given its characteristic as a resource with an upward-sloping cumulative supply curve over time. As Table 4 and Figure 1 indicate, the price of copper has increased exponentially, driven largely by the growth of the Chinese economy. Because of the current global financial crisis, the price of copper has decreased, but it is still over twice as high as it was at the time it was used in the New Zealand determination.[55] A question may arise as to how regulation should take account of the "inaccuracy" of the futures market prediction made in 2007. Academic research has demonstrated that futures markets are the best predictors of future commodity prices.[56] While the predictions sometimes turn out to be high (as now) they are often also low. No better predictor exists for future prices, so the future price of copper should be incorporated into the decision of estimating forward-looking cost.

We can now relate the decision of New Zealand's regulators in 2007 to that of California's regulators in 2006. We have analyzed 2003 data used in the 2006 CPUC decision that adopted rates for local loops averaging about US$14 for Verizon California. As noted earlier, if we use 2006 copper prices instead of 2003 levels, the resulting loop rate could have been more than 40%. Copper cable accounted for about 12% of total loop investment in the CPUC's calculations. Therefore, increasing copper cable input prices by the factor of 4.4 that the spot market price for copper increased between June 2003 and June 2006 would increase the loop cost by about 40%, resulting in an estimate of about US$20 instead of US$14.

Is the increased price of copper reflected in the Commerce Commission's benchmark data set? The share of copper cost in total LLU cost, consistent with the CPUC's cost model, implies an estimated coefficient in a log-log regression model of approximately 0.12. We took the data set consisting of the U.S. states and three of the four other countries[57] and put in the price of copper in the year of the decision, under

55. *See supra* p. 207 fig.1.

56. See, e.g., Eugene Fama and Kenneth French, Commodity Future Prices: Some Evidence on Forecast Power, Premiums, and the Theory of Storage, 60 J. Bus. 55 (1987).

57. We exclude Norway from the sample because we cannot tell on which year of data the LLU price was based.

the hypothesis that the LLU estimates are forward-looking, as required by the Commerce Commission. The results are in Table 5.

Table 5: Log Regression Model with Copper Price

ln_llu_nz	Coef.	Std. Err.	t	P>|t|
ln_popdensity	-0.045	0.020	-2.22	0.03
ln_urbanpop	-0.238	0.079	-3.01	0.00
ln_teledensity	-0.139	0.072	-1.93	0.06
ln_coppermt	-0.202	0.091	-2.22	0.03
_cons	4.782	0.794	6.02	0.00
Number of obs	54.000			
R-squared	0.594			
Root MSE	0.147			

Contrary to the expectation that the estimated coefficient of the log copper price should be positive and approximately 0.12, the regression results find a *negative and statistically significant* coefficient of -0.202. Thus, the Commerce Commission's sample of LLU prices does not correctly reflect the exponential increase in the copper price during the sample years. Instead, that sample demonstrates that regulators, at least in the United States, continued to decrease the LLU rates over time to attempt to encourage more competitive entry.[58] This attempt largely failed. Many states, including California, have now deregulated local landline prices, as competing technologies constrain the price of local telephone service.

Thus, the increased price of copper is not reflected in the data relied on by the Commerce Commission. The Commission recognizes this potential problem, as it concedes that "costs may evolve over time and regulated rates may become outdated."[59] However, the Commerce Commission did no economic or econometric analysis to determine whether the international rates it used reflected costs (i.e., copper prices) that have, in fact, evolved over time. In particular, when one examines the August 2006 decision of the Australian Competition & Consumer Commission (ACCC) on LLU,[60] which the Commerce Commission used in its own estimate, one can find no reference to taking into account the

58. A regression model with a yearly indicator variable (rather than copper prices) finds a monotonic decreasing LLU rate across years after controlling for the three variables used in the regression specification. This finding is consistent with regulators decreasing LLU rates over time to attempt to encourage more entry.

59. *Initial Decision 609*, *supra* note 14, at 21.

60. Assessment of Telstra's ULLS Monthly Charge Undertaking (Australian Competition & Consumer Comm'n Aug. 28, 2006) (final decision), *available at* http://www.accc.gov.au/content/index.phtml/itemId/759855/fromItemId/721622 (follow "Final decision—Assessment of Telstra's ULLS monthly charge undertakings—August 2006.pdf" hyperlink).

increased price of copper, which should be included in a forward-looking price determination. Thus, the ACCC decision does *not* appear to be forward-looking, contrary to the Commerce Commission's determination.

However, we note that Telstra, the incumbent network operator in Australia, is well aware of the effect of the increased price of copper. In an August 2006 submission to the ACCC, Telstra noted a 76% increase in the prices of copper and brass and a 48.8% increase in the price of electric cable and wire over the previous four years, using data from the Australian Bureau of Statistics Web site.[61] The submission then estimated "implied price escalators" for distribution conduit and trenching, main conduit and trenching, distribution cable, and main cable.[62] Each escalator exceeded 20% over the previous four-year period.[63] Overall, Telstra's filing estimated a 22.7% increase over the previous four years for the prices of "composite for network assets."[64] This evidence—drawn from the Australian government's own statistical sources—counsels the ACCC to recheck the plausibility of its estimates of the forward-looking costs of Telstra's network.

As it currently stands, the Australian data that the Commerce Commission used in the New Zealand proceeding are not forward-looking. They lead to downward bias in the estimates of the forward-looking LLU price. The failure of regulated LLU rates to capture accurately the most important input cost, other than labor, demonstrates that the benchmarking approach cannot lead to accurate LLU estimates. However, to the extent that the Commerce Commission must estimate benchmark LLU rates, we suggest the Commerce Commission take the geometric average of the regression model estimate, NZ$22.95, and then apply a 42.8% adjustment factor using the LME copper price in June 2007, because the modal date for the data is 2003. Using this copper adjustment factor leads to an adjusted median estimate of NZ$32.78.[65] Otherwise, the Commerce

61. Supporting Witness Statement, The Matter Undertakings Dated 23 December 2005 in Respect of Unconditioned Local Loop Service, para. 9 (Australian Competition & Consumer Comm'n Aug. 21, 2006) (testimony provided by Telstra Corp. Ltd. on Price Indices Supplement Statements), *available at* http://www.accc.gov.au/content/index.phtml/itemId/771159/fromItemId/743667 (follow the "Price Indices Sup Statement (21 Aug 06).pdf" hyperlink) [hereinafter *Telstra Corp. Price Indices Supplement Statements*]. The witness relied on information from the Australian Bureau of Statistics.

62. *Id.* at para. 12.

63. *Id.*

64. *Id.* at para. 16.

65. The change in the copper price from June 2003 to June 2007 is used for the adjustment. We make all adjustments using constant New Zealand dollars. Ideally, if data on the change in the price of copper cable from 2003 to 2007 were available (e.g., from carriers participating in the regulatory proceeding), a more refined adjustment to the benchmark would result.

Commission estimate will not be forward-looking because it will not account for the increased price of copper.

E. Subsequent Developments

In November 2007, the Commerce Commission issued a final version of its draft decision on the UCLL.[66] Unlike the draft decision, the final decision used a stepwise regression to select the appropriate variables.[67] However, stepwise regression is well-known to be an unreliable econometric technique.[68] Consequently, the bias that we found in the Commerce Commission's initial results still affect its final results that use a stepwise regression.

Furthermore, the Commerce Commission claimed in its final decision that it could not consider the use of forward-looking copper costs due to the constraints of the benchmarking process under an initial pricing principle (IPP).[69] The Commerce Commission stated that the legislation requires the Commission, at the IPP stage, to undertake "[b]enchmarking against prices for similar services in comparable countries that use a forward looking cost-based pricing method."[70] The Commerce Commission thus collects data on rates for copper loops that overseas regulators have classified as forward-looking cost-based access prices. But the Commerce Commission evidently believes that it has neither an express legislative mandate nor any inherent discretion to evaluate the accuracy of those overseas prices and adjust the New Zealand price accordingly. If the overseas regulators have erroneously labeled prices as being forward-looking when they are not, the Commerce Commission evidently believes that it is powerless to avoid repeating their errors at the IPP stage. The Commerce Commission evidently believes that, if the increased price of copper does have the impact that we find, that impact will be reflected in any subsequent TELRIC modeling that will be done if either the access seeker or the access

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66. Standard Terms Determination for the Designated Service Telecom's Unbundled Copper Local Loop Network, Decision 609 (N.Z. Commerce Comm'n Nov. 7, 2007) [hereinafter *Final Decision 609*], *available at* http://www.comcom.govt.nz (enter 625260 into search field).

67. *Id.* at paras. 159-164. The final decision states: "Based on the corrected data set, the Commission has adopted a general-to-specific approach, which starts from a comprehensive model that includes all the variables that are expected to be relevant, and which then is simplified by dropping insignificant variables in a step-wise manner." *Id*. at para. 159 (citation omitted).

68. *See, e.g.*, PAUL A. RUUD, AN INTRODUCTION TO CLASSICAL ECONOMETRIC THEORY 236-37 (2000) ("the statistical properties of stepwise regression are intractable"); DAMODAR N. GUJARATI, BASIC ECONOMETRICS 460 (3d ed. 1995).

69. *Final Decision 609*, *supra* note 66, at para. 184.

70. *Id.* at para. 58 (quoting Telecommunications Act, 2001, schedule 1, part 2 (N.Z.)).

provider requests a final pricing principle (FPP).[71] In short, the Commerce Commission regards such adjustments under the terms of the legislation to be more applicable to a FPP than an IPP.

As a matter of empirical reasoning, this explanation for neglecting copper prices is unpersuasive. The Commerce Commission's final decision states explicitly, as did its initial decision, that the methodology should be *forward-looking*. It is a fact that fixed-line networks are based on copper loops. It is a fact that the price of copper has increased significantly. Yet, the Commerce Commission did not adjust the benchmarking results to account for the increased price of copper.[72] By definition, neglecting the price of copper prevents the Commerce Commission's LLU prices from being forward-looking. The Commerce Commission's methodology produces no reliable economic information to support a regulatory decision. Legal consequences properly follow. Depending on the jurisdiction, such a result could be unlawful. The resulting regulation might be characterized, by U.S. standards, as unsupported by the evidence, resting on inadmissible "junk science," being arbitrary and capricious (Daubert standard), being contrary to the statutory requirement that prices be forward-looking, or even being confiscatory in violation of constitutional protections of private property.

V. REGULATORY OPPORTUNISM AND THE FAILURE TO RECTIFY THE KNOWN DEFICIENCIES OF TELRIC PRICING: THE ILEC'S RIGHT UNDER ANTITRUST AND TELECOMMUNICATIONS LAW TO DECOMMISSION COPPER LOOPS

TELRIC pricing was originally adopted at a time when U.S. regulators widely appeared to believe that unbundled elements would not

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71. The Commission may also be concerned that its adjustment of loop prices in the face of rising world copper prices would invite questions as to why it had not also adjusted the forward-looking costs of trenching, labor, and other inputs associated with rebuilding the local loop.

72. A similar situation has continued in Australia. In May 2008 both Telstra, the network owner, and Optus, an access seeker, made submissions recommending that the Australian Competition and Consumer Commission (ACCC) take account of the higher price of copper in its access price determination. *See* Telstra Corp. Ltd., Submission in Response to the Commission's Draft, Unconditional Local Loop Service, Austl. Competition and Consumer Comm'n (May 14 2008), *available at* http://www.accc.gov.au/content/index.phtml/itemId/825161 (follow the "Telstra submission" hyperlink); Optus, Submission on ULLS Pricing Principles and Indicative Prices, Austl. Competition and Consumer Comm'n, (May 27, 2008) *available at* http://www.accc.gov.au/content/index.phtml/itemId/825161 (follow the "Optus submission" hyperlink). The ACCC continued to ignore the increase in copper prices in its decision. Austl. Competition and Consumer Comm'n, Unconditional Local Loop Service: Pricing Principles and Indicative Prices, (June 2008) *available at* http://www.accc.gov.au/content/index.phtml/itemId/825161 (follow the "Final indicative prices and pricing principles for ULLS.pdf" hyperlink).

only "jump start" competition, but also would be a major source of competition by themselves. Accordingly, it is not surprising that regulators have often regarded the growth in the number of competitors' lines as an important measure of the success of competition policy, regardless of the investments required to provide those lines.[73] As a result of a circuitous legal and regulatory path, greater emphasis on full facilities-based competition—typically over platforms other than traditional copper loops—is becoming increasingly prominent at the same time that competition from providers reselling all or parts of incumbent networks has receded. However, the regulatory reform of TELRIC pricing that would naturally accompany this shift in direction has stalled. This and other sources of regulatory lag have resulted in TELRIC prices that are still based on a methodology that the FCC, its sponsor, has tentatively concluded is in need of reform. Perhaps more important, extant values of critical components such as unbundled loops are based on inputs that are out of date because of the changes in copper prices and perhaps other markets supplying telecommunications inputs.

With these developments, the challenge of developing economically-proper regulated input prices (through either extensive cost studies or benchmarking other jurisdictions) becomes increasingly difficult. Under these circumstances, it is important that artificially low input prices not be maintained by failure to adjust out-of-date costs in the hopes that they will give the appearance of more competition, under the guise of greater volumes supplied not by competitors investing in network technologies, but by carriers that continue to resell the older technology of incumbent providers.

Given the high price of copper, an ILEC faces a strong incentive to replace its copper loops with fiber optic cable and then recycle the valuable copper. The removal of copper loops from service, however, would adversely affect CLECs that have built business models that rely on the continued availability of copper loops. Consequently, the following question arises as a matter of telecommunications or antitrust law: does the ILEC have a duty to keep copper loops in service after they have been replaced with fiber optic cable? Must the ILEC continue to offer unbundled

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73. For example, during the time when the unbundled element platform (UNE-P) was being offered in the United States, state regulators generally lowered its price. At its peak—when the FCC was beginning to respond to court directives that ultimately ended the availability of UNE-P at favorable regulated rates—over 60% of the competitive lines in the U.S. were obtained at wholesale from the incumbents and involved no use of competing network facilities. *See, e.g.*, Timothy J. Tardiff, *Changes in Industry Structure and Technological Convergence: Implications for Competition Policy and Regulation in Telecommunications*, 4 INT'L ECON. & ECON. POL'Y 109 (2007), *available at* http://www.springerlink.com/content/wg612681347lk809/.

copper loops to CLECs at regulated prices and thus forgo the opportunity to recycle that copper in the commodities markets? Under American law, no such obligation exists.

Federal telecommunications law imposes no duty on the ILEC to keep copper loops in service for the benefit of CLECs. To the contrary, section 706 of the Telecommunications Act of 1996 imposes a duty on the FCC that points in the opposite direction: the Commission "shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans . . . by utilizing . . . regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment."[74] "[A]dvanced telecommunications capability" is a term of art that the Telecommunications Act defined to be "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology."[75] The deployment of fiber to the home (FTTH) or fiber to the curb (FTTC) and the concomitant retirement of copper facilities lower an ILEC's costs of maintaining its networks and enable the ILEC to provide a wider range of services to compete with cable's triple-play bundles. That replacement of copper with a superior infrastructure is also congruent with regulatory policy.

The FCC has clearly stated that an ILEC may decommission copper wires when it has replaced them with alternate fiber facilities.[76] The ILEC must provide reasonable notice to the FCC, with an opportunity for CLECs to comment.[77] If the FCC takes no action in response to the ILEC's notice of decommissioning, the ILEC may proceed to decommission the facilities and scrap the copper.

Where the ILEC replaces existing mass-market copper facilities with optical fiber, it must make a voice channel of the fiber available for unbundled access. Thus, to the extent that CLECs currently serve customers through an existing copper facility, they continue to have the option to compel the ILEC to supply continuing access to voice UNEs.[78] In

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74. Telecommunications Act of 1996, Pub. L. No. 104-104, tit. VII, § 706(a), 110 Stat. 56, 153 (codified at 47 U.S.C. § 157 note).

75. *Id.* § 706(c)(1).

76. Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, *Report and Order and Order on Remand and Further Notice of Proposed Rulemaking*, 18 F.C.C.R. 16978, para. 273 (2003) [hereinafter *2003 Triennial Review*], *rev'd in part*, U.S. Telecom Ass'n v. FCC, 290 F.3d 415 (D.C. Cir. 2003).

77. *See* 47 U.S.C. § 251(c)(5) (2000).

78. Recall that the purpose of mandatory unbundling in the United States under the Telecommunications Act of 1996 (unlike its purpose in Europe) was to increase competition in voice telephony, not broadband Internet access. *See* Hausman & Sidak, *Did Mandatory Unbundling Achieve Its Purpose?*, *supra* note 10. Consequently, it is not relevant to the

this respect, the ongoing ability of CLECs to compete in the supply of voice service is thereby unimpaired. The Telecommunications Act, however, does not give CLECs the right to freeze an existing technology for providing access to the incumbent local exchange network. Where optical fiber is not replacing existing copper facilities—i.e., in new developments or where CLECs are not providing service—the ILEC may retire redundant copper facilities without incurring new unbundling duties.[79]

There is no indication that the FCC's procedures by which an ILEC gives notice of its intent to remove copper loops from service compromises the growth of facilities-based competition in telephony. The retirement of copper loops is not impairing universal service or retarding broadband deployment. To the contrary, retirement and redeployment of a valuable but inefficiently used resource reflects an ILEC's powerful incentive to transition its services to a next-generation platform. By deregulating unbundled broadband elements following the early failures of the Telecommunications Act of 1996, the FCC removed regulatory distortions that impeded true intermodal competition among different technology platforms—cable, wireless, satellite, and ILECs. If, in contrast, an ILEC were not permitted to retire its copper loops, it would be effectively forced to maintain a duplicative network, replete with the costs of maintaining that network. By scrapping its obsolete copper loops, the ILEC can invest its resources into deploying a more powerful network of optical fiber.

American antitrust law supports the same conclusion. A CLEC might argue that the ILEC's retirement of copper loops violates section 2 of the Sherman Act.[80] A court analyzing such a claim by a CLEC would look for exclusionary or predatory behavior that would "reasonably appear[] capable of making a significant contribution to [creating or] maintaining

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legal analysis here whether or not a CLEC could provide DSL service over the voice channel that the ILEC would make available after decommissioning a copper loop.

79. *See, e.g.*, *2003 Triennial Review Order*, *supra* note 76, para. 273. The D.C. Circuit has also explained:

> Specifically, the FCC did not require ILECs unbundle fiber-to-the-home (FTTH) loops (*i.e.*, loops extending from the ILEC's central office all the way to the customers' premises) in places where fiber loop plant had not previously existed: "greenfield" situations (*i.e.*, new residential areas where no lines had existed) and "overbuild" situations (*i.e.*, locations where only copper loop plant was in place). In the latter, however, if the ILEC decides to retire the incumbent copper loops, it must then make its fiber loops available—albeit only for narrowband, not broadband uses.

Earthlink, Inc. v. FCC, 462 F.3d 1, 5 (D.C. Cir. 2006) (citations omitted).

80. Sherman Anti-Trust Act, ch. 647, 26 Stat. 209, 209 (1890) (current version at 15 U.S.C. § 2 (2000)).

monopoly power."[81] Under this theory, the elimination of copper loops would cause the demise of certain CLECs.

But, that theory of liability is untenable both because the ILEC would lack the requisite monopoly power and because the requisite anticompetitive conduct would be absent. Even if one were to assume the narrowest definition of the market in question—voice service—it is implausible that ILECs exert monopoly power today.[82] Competition from cable companies and wireless companies effectively constrain ILECs from raising retail prices for voice service. The fact that every Bell Operating Company has received and retained approval under section 271 of the Telecommunications Act to provide interLATA service within its state confirms that these ILECs face effective competition within their local exchange footprints.[83] Further confirmation of that fact is found in the decision of many states to deregulate local telephone service.[84] Given the existence of pervasive facilities-based competition, the elimination of non-facilities-based CLECs (which would be highly speculative given the requirement to continue unbundling a voice channel where CLECs have captured subscribers) would not harm consumer welfare. Finally, barriers to entry no longer exist in light of the heavy investment in access networks already made by cable, traditional phone, wireless (in WiMax), satellite, and electric power companies. This evidence of facilities-based competition and entry also makes the essential facilities doctrine inapplicable.[85]

Even if an ILEC were found to possess the requisite monopoly power, liability could not follow because the conduct in question—the decommissioning of copper loops—does not violate a monopolist's duty under the Sherman Act. An ILEC's sale of scrapped loops on the world copper market is not predatory within the framework of *Brooke Group Ltd.*

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81. United States v. Microsoft Corp., 253 F.3d 34, 79 (D.C. Cir. 2001) (en banc, per curiam) (quoting 3 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION, sec. 651c (1996)).

82. *See, e.g.*, Dennis W. Weisman, *When Can Regulation Defer to Competition for Constraining Market Power?: Complements and Critical Elasticities,* 2 J. COMPETITION L. & ECON. 101 (2006); Dennis W. Weisman, *Assessing Market Power: The Trade-off Between Market Concentration and Multi-Market Participation,* 1 J. COMPETITION L. & ECON. 339 (2005).

83. *See* Verizon Comm. Inc. v. Law Offices of Curtis V. Trinko, 540 U.S. 398, 412 (2004) ("To be allowed to enter the long-distance market in the first place, an incumbent LEC must be on good behavior in its local market.").

84. *See, e.g.*, Verizon Virginia Inc. and Verizon South Inc. – For a Determination that Retail Services are Competitive and Deregulating and Detariffing of the Same, No. PUC-2007-00008 (Commw. of Va. State Corp. Comm. Dec. 14, 2007) (order on application).

85. *See* Hausman & Sidak, *A Consumer-Welfare Approach to Mandatory Unbundling of Telecommunications Networks*, *supra* note 10, at 467-71; Abbott B. Lipsky, Jr. & J. Gregory Sidak, *Essential Facilities*, 51 STAN. L. REV. 1187 (1999).

v. Brown & Williamson Tobacco Corp.[86] because no economic loss (or even a profit sacrifice) would result from moving these assets to their highest-valued use. An ILEC's retirement of copper loops does not require it "to suffer losses today on the chance that it will reap supracompetitive profits in the future."[87] This conduct by the ILEC is rational in both the short run and the long run, regardless of what happens to its competitors. That conclusion necessarily follows from the fact that the regulated prices of unbundled loops are likely to be materially below the true forward-looking incremental cost of building a copper network (i.e., because such prices are unlikely to account for the higher copper price.) Far from being predatory or self-harming, an ILEC's decision to retire copper wires is an exercise of sound business judgment that immediately increases the value of the firm. The increased price of copper, coupled with the reluctance of regulators to adjust TELRIC cost models accordingly, means that an ILEC will capture profit—not sacrifice it—by substituting optical fiber for copper.[88] Thus, unlike the facility owner being sued on section 2 grounds in *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*,[89] an ILEC decommissioning copper loops could not be found "to forgo . . . short-run benefits because it was more interested in reducing competition in the . . . market over the long run by harming its smaller competitor."[90]

A CLEC might cast an ILEC's scrapping of its copper loops as a refusal to deal. The general rule, of course, is that even a monopolist may refuse to deal. An ILEC's refusal to continue leasing copper loops would not fall within *Aspen Skiing*'s narrow exception to that general rule, for the ILEC had no prior course of voluntary dealing with rivals to supply unbundled copper loops.[91] The Supreme Court emphasized in *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko*, that antitrust law

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86. 509 U.S. 209, 224 (1993).

87. Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber Co., 127 S. Ct. 1069, 1077 (2007).

88. Based on the experience of electric utilities that sought merger approvals after nuclear power plants (long considered to have high operating costs relative to other generation technologies) increased in value due to rising fossil fuel prices, the ILEC seeking to decommission valuable copper loops would be more likely to face the threat of regulatory holdup; regulators would attempt to expropriate for retail customers some portion of the exogenous increase in the value of the copper loops by threatening to oppose the ILEC's notice of decommissioning. *See* Paul W. MacAvoy & J. Gregory Sidak, *The Efficient Allocation of Proceeds from a Utility's Sale of Assets*, 22 ENERGY L.J. 233 (2001).

89. 472 U.S. 585 (1985).

90. *Id.* at 608.

91. *Id.*; *see also* Verizon Comm. Inc. v. Law Offices of Curtis V. Trinko, 540 U.S. 398, 409 (2004) ("The Court [in *Aspen*] found significance in the defendant's decision to cease participation in a cooperative venture. The unilateral termination of a voluntary (*and thus presumably profitable*) course of dealing suggested a willingness to forsake short-term profits to achieve an anticompetitive end." (internal citation omitted)).

permits a monopolist to make investments without imposing an obligation to share the fruits of those investments.[92] An ILEC's refusal to continue to operate decommissioned copper loops, therefore, would not constitute anticompetitive conduct necessary for a finding of liability under section 2 of the Sherman Act. As Judge Posner stressed in his opinion for the Seventh Circuit in *Olympia Equipment Leasing Co. v. Western Union Telegraph Co.*,[93] a firm's attempt to exit a market fundamentally differs from an attempt to monopolize one. One can make a similar argument that the retirement of an asset that a firm no longer needs to produce a product differs from an attempt to monopolize a downstream market in which the firm competes by refusing to sell access to an essential upstream input to competitors. Antitrust law generally imposes negative obligations on a monopolist—not affirmative obligations—such that "a firm with lawful monopoly power has no general duty to help its competitors, whether by holding a price umbrella over their heads or by otherwise pulling its competitive punches."[94] Similarly, when it decommissions copper loops, an ILEC does not act in a predatory fashion but is instead transitioning from an inferior technology to a superior one that is needed to respond to the competitive product offerings of its rivals.

VI. CONCLUSION

Regulators have set prices for unbundled network elements on the basis of total element long-run incremental cost, which in turn is calculated using engineering cost models that require detailed estimates of the equipment and installation prices of the numerous components that are used in a telecommunications network. When there is uncertainty about how these prices will change over the period for which costs and prices are required, the resulting cost estimates used for setting the regulated prices of unbundled network elements can be very inaccurate. Similarly, when regulators in other jurisdictions are considering such rates as "benchmarks," it is necessary to make adjustments to account for such large differences in critical input prices, so that the benchmark rates will be representative of the costs that will be incurred by efficient carriers offering unbundled elements in those jurisdictions.

The precipitous rise in the price of copper since 2003 exemplifies this need to reevaluate the inputs used by regulators in their cost model as well as the inferences drawn from those models. The global financial crisis did not eliminate this concern, as copper prices in late 2008 were still roughly twice the 2003 level. Accounting for such evidence of the actual market

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92. *See Trinko*, 540 U.S. at 407-08.
93. 797 F.2d 370, 373-77 (7th Cir. 1986) (Posner, J.).
94. *Id.* at 375.

price of copper would change the forward-looking costs of a hypothetically efficient ILEC network that one of the most prominent U.S. state regulatory commissions—the California Public Utilities Commission—established in 2006. Similarly, in 2007, New Zealand's Commerce Commission employed a benchmarking methodology for the pricing of unbundled loops that failed to account for the increased price of copper. For the input requirements of their own forward-looking cost models to be satisfied and economically proper network element prices to be attained, it is important for regulators to resist the opportunistic policy of employing forward-looking costs only when doing so produces lower regulated prices over time.