Investment and the Level of UNE-P Rates: A Critique of the Willig Study

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A. Introduction and Scope

1. A central issue in the debates over TELRIC and its implementation is the effect that UNE-P rates have on investment in the telecommunications industry.[1] This paper will show that while lower UNE-P prices may lead to increased UNE-P competitive entry, this comes at the high cost of decreased facilities-based entry. The net effect is unambiguously to reduce investment by both RBOCs and CLECs. My findings contrast sharply with those proffered by Dr. Robert Willig on behalf of AT&T. As I will show, his results do not stand up to careful scrutiny. The variables he uses to measure investment and competitive entry are fundamentally flawed and are the primary drivers of his mistaken conclusions. Once his study is corrected, it is clear that his primary finding that lower UNE prices stimulate investment by all telecommunications providers is not only theoretically flawed, but also completely contrary to marketplace evidence. The corrected study shows that lower UNE prices result in reduced investment in the telecommunications infrastructure.

2. Dr. Willig bases his conclusion that lower UNE prices stimulate investment in the telecommunications industry on two separate studies. The first study (a reduced form

[1] *See, e.g.,* Qwest Comments at 5-6; Verizon Comments at 8-18; SBC Comments at 11-12; AT&T Comments at 30-37; MCI Comments at 10-13; Sprint Comments at 9-10; CLEC TELRIC Consortium Comments at 6.

analysis) finds that there is a correlation between lower UNE prices and increased ILEC investment. He then uses a two-stage structural model that purports to find lower UNE prices lead to increased CLEC entry into the market, and that increased CLEC entry will stimulate increased ILEC investment. On its face, this analysis appears counterintuitive. Why would an ILEC increase its investment in its network only to turn around and lease it to wholesalers at an amount that can be less than the cost to deploy the facilities? Why would the mere existence of companies that lease the same network used by the ILECs to provide service prompt those ILECs to invest more in that one network? What we find upon correcting Dr. Willig's analysis is not only that his findings are counterintuitive, but they are also counterfactual. In fact, investment by both ILECs and CLECs decreases with reductions in UNE rates.

3. Dr. Willig's finding in his reduced form equation that lower UNE prices result in increased ILEC investment is predicated exclusively on the selection of an independent variable for measuring ILEC investment – investment per capita. In determining the population over which to spread investment, he does not use ILEC customers, or even customers in the ILEC service area. More importantly, his finding that investment per capita *falls* at higher UNE prices is consistent with my finding that total investment, <u>in the same area</u>, *increases* at higher UNE prices. This apparent paradox is easily explained, and I will show that his findings are attributable solely to his selection of investment per capita as the relevant variable.

4. The conclusions Dr. Willig derives from his structural study are similarly flawed. In this two-step study he determines that lower UNE prices result in increased market entry by CLECs and that increased market entry by CLECs stimulates ILEC investment. Again his analysis measures investment on a per capita basis. However, there are even more significant flaws in this analysis:

- To measure competition, he identifies the number of competitors in the state and the area served by these competitors, as opposed to the more direct measure of customers served by competitors in the state.
- In determining CLEC entry, he does not disaggregate the data between facilities-based and non-facilities-based competitors.

Actual market entry is a superior measure of competition compared with the number of providers. Disaggregating market entry between facilities-based and non-facilities-based competitors is critical to this proceeding. It would appear obvious that facilities-based competition would spur additional investment by the ILEC as it seeks to keep up with the competition or differentiate itself from the competition. The same incentives would not appear to exist with non-facilities-based competition since these competitors are only able to duplicate the ILECs' services and not improve on them. Disaggregating the results to show the separate effects of facilities and non-facilities-based CLEC entry produces the results one would logically expect. Lower UNE prices may increase the level of non-facilities-based entry but stifles facilities-based entry. I also find that it is the deployment of alternative networks that has the greatest impact on stimulating investment by ILECs, as they seek to hold market share, and low UNE prices only serve to undermine facilities-based entry into the market.

5. Whether or not TELRIC has thwarted investment weighed heavily in the Supreme Court decision on TELRIC in *Verizon v. FCC*. In that case, the majority found that "actual investment in competing facilities since the effective date of the Act simply belies the no-stimulation argument's conclusion[][2] and "a regulatory scheme that can boast such substantial competitive capital spending over a 4-year period is not easily described as an unreasonable way to promote competitive investment in facilities."[3]

Justice Breyer countered in his dissent that

> "[T]he majority cites figures showing that in the past several years new firms have invested $30 to $60 billion in local communications markets. We do not know how much of this investment represents facilities, say broadband, for which an incumbent's historical network offers no substitute. Nor do we know whether this number is small or large compared with what might have been."[4]

The unresolved economic question concerns how UNE-P rates impact ILEC and CLEC investment. Dr. Willig has provided evidence on behalf of AT&T that purports to answer this question:

> "The analysis shows that there is no valid foundation for the view that investment would be enhanced by any effort to reinterpret current TELRIC rules in a manner that raises UNE prices. To the contrary, the data indicate that higher UNE prices would weaken competition and discourage investment by both ILECs and CLECs."[5]

Dr. Willig's study is the focus of my analysis. Not only are its conclusions unfounded and counterintuitive. A proper analysis of the data reveals that the actual results support

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[2] *Verizon v. FCC*, 535 U.S. 467, 504 (2002).
[3] *Id.* at 517 (footnote and citations omitted).
[4] *Id.* at 552 (citations omitted).
[5] AT&T ex parte, WC Docket No. 03-173, "Investment Is Appropriately Stimulated by TELRIC," Robert D. Willig, at 3.2 (December 5, 2003).

the opposite conclusion: ***higher UNE prices would stimulate both ILEC and CLEC investment, while lower UNE prices discourage such investment.***

6. Dr. Willig characterizes the competing positions as (1) *The Investment Deterrence Hypothesis*, where low UNE prices undermine the incentive and ability of ILECs to invest; and (2) *The Competitive Stimulus Hypothesis*, whereby lower UNE prices enhance CLEC entry and this, in turn, stimulates ILEC investment as a competitive response. Dr. Willig presents two analyses in support of his conclusion. The first is a reduced form equation that estimates ILEC investment in the 49 RBOC jurisdictions as a function of demand and regulatory factors, focusing on the relationship between UNE-P rates and RBOC investment. I will show that Dr. Willig's results are artifacts of his inappropriate definition of investment – once this error is corrected, the support for the Competitive Stimulus Hypothesis disappears. I provide this analysis in Section B and Appendix 2.

7. Dr. Willig's second analysis is a structural equation approach that simultaneously estimates CLEC entry and ILEC investment. Unfortunately, he makes no distinction between facilities-based and non-facilities-based entry, and provides measures of competitive entry that are not sound measures of either type of entry. I provide separate estimations for the different types of entry and show that lower UNE prices have indeed reduced facilities-based entry (and, in turn, ILEC investment). Any UNE-P entry that may have been promoted by low UNE prices is more than offset by the deleterious effect on facilities-based investment. I examine this in Section C and Appendix 3.

The analyses in my declaration rely on statistical models. Appendix 1 sets out a primer on p values and statistical significance so that these results are widely accessible and understood by policymakers who do not work with statistical inference on an everyday basis.

B. The Reduced Form Models

8. Dr. Willig uses data from 1996 through the end of 2001 (end-of-year, EOY). My analysis adheres to this same time period. During this period RBOC investment was increasing (total net plant in service increased by 18% during the time period). Investment leveled off during 2001 and has dropped since that time.[6] During the same time period, CLEC market share went from virtually nothing to 13% of the nation's lines.[7] At the same time, UNE prices were dropping in most jurisdictions. Thus, this time period provides the "perfect storm" in which to analyze the relationship between UNE prices and investment. These aggregate trends, however, tell us nothing about the question at hand. To determine how UNE prices affect investment, we must examine the variation in both, and this can be accomplished by looking across the states. State regulators have set different UNE prices, and states have experienced different degrees of competitive entry and different levels of ILEC investment. It is by analyzing this variation in results across the natural laboratory, that is, the different states, that we may find the actual relationships amongst these variables.

[6] All RBOC investment data is from ARMIS Report 43-01.
[7] FCC Local Competition Report, data as of 12/31/2001.

9. Dr. Willig estimates ILEC investment as a function of a variety of demographic, economic and regulatory variables. I first attempt to match his variables as closely as possible – both to replicate his findings and to ascertain the validity of his findings. I then provide my own model that corrects the deficiencies which I identify in Dr. Willig's study.

The principal flaw in Dr. Willig's reduced form equation is the selection of the dependent variable in the model. Dr. Willig does not use ILEC investment as the dependent variable, but rather ILEC investment *per capita*. He provides little rationale for examining investment on a per person basis even though this is the key driver of his results. It turns out that higher UNE-P rates are associated with more ILEC investment, but less ILEC investment per capita.

10. The following table shows Dr. Willig's results, the result of my attempt to replicate his study, and the results of modifying his study to replace per capita investment in each state with total investment in each state.

Dr. Willig's Results and the Replacement of Investment Per Capita with Total Investment
(Coefficients are shown with p-values in parentheses)

Variable and data sources	Dr. Willig's reduced form equation	My replication of Dr. Willig's results	What happens if per capita investment is replaced by total investment
Dependent variable	ILEC investment 1996–EOY 2001 (per capita)	ILEC invest-ment 1996-EOY 2001 (per capita)	ILEC investment 1996-EOY 2001
Net plant in service per capita, 1996 (in the last column, I replace this with 1996 state population, since the use of total investment requires that state size be one of the independent variables used to account for it)	.0425 (p=.42)	.3096 (p<.0001)	State Population .0732 (p<.0001)
Labor Force Share in FIRE, 2000	899.0359 (p=.06)	.0008 (p=.90)	64,902 (p=.12)
Population growth 1996-2002	226.8131 (p=.0001)	.0124 (p<.0001)	46,211 (p=.0001)
Average unemployment (I use unemployment in 2000)	-10.3304 (p=.11)	.0166 (p=.07)	-3199 (p=.96)
Average residential revenue (I use average total revenue)	6.6225 (p=.002)	-.0003 (p=.03)	1197 (p=.14)
TELRIC (HCPM)	-4.1276 (p=.005)	-.004 (p=.10)	-9074 (p=.56)
Total Service Rebate	55.7267 (p=.72)		
UNE price (urban UNE-P price from AT&T data for Willig; my own data for the other columns)	-3.9071 (p=.005)	-.0032 (p=.02)	-54 (p=.99)
Price cap	-3.1070 (p=.88)	.032 (p=.15)	24,706 (p=.86)
Price cap w/interim freeze	1.3444 (p=.95)		
Freeze w/non-index cap	5.8072 (p=.81)		
Deregulation	-193.5255 (p<.0001)		
Constant	-75.1956 (p=.35)	.0783 (p=.46)	
Number of observations	47	49	49
R^2	.7730	.7852	.7447
Adjusted R^2	.6929	.7422	.6936

Note that the table numbers in parentheses are p values.[8]

Notes:

There are some differences between Dr. Willig's model and my replication that were required by data availability. The following should be noted:

- Dr. Willig reports 47 observations; I show 49 (all states with RBOC jurisdictions plus the District of Columbia). He does not indicate which 2 jurisdictions were omitted, or why.
- Dr. Willig uses proprietary AT&T data on UNE-P prices and I use my own data set complied from a variety of investment and regulatory sources. He also reports results for the publicly available NRRI estimates of UNE-P price levels. He finds a negative coefficient which is not statistically significant (p=.27). I also find a negative coefficient (p=.133). Paradoxically, despite the fact that the UNE-P price is not significant in that formulation, he reports that "we have gathered data on UNE prices from alternative sources and confirmed that our results are not dependent on the idiosyncrasies of one particular data source."[9] Later in the document, he is a bit more accurate, though no less circuitous: "We also see no statistically significant coefficient using these four sets of data that reverse the sign of a significant coefficient obtained using the AT&T data."[10] As he prefers to use the AT&T data, which shows a significant negative correlation between investment (per capita) and UNE-P prices, I will focus the analysis on my close replication of those results using my own UNE-P prices. While I do not report the results using other UNE-P price measures (such as the NRRI data), that inverse relationship with investment per capita disappears when total investment is used as the dependent variable.[11]
- I did not have data for the total service rebate so that is omitted from my analysis (note that Dr. Willig's variable is far from significant in his model).

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[8] In reading the table, the p values represent the probability of incorrectly claiming the independent variable has an impact on the dependent variable (investment). Put another way, if the p value exceeds 5%, a 95% confidence interval for the true effect of that independent variable on the dependent variable would include both positive and negative correlations. The closer the p value is to one, the more symmetric the confidence interval is around zero. A p value of 100% would literally mean that the variable's effect is equally likely to be positive as negative, according to the evidence available. For those unfamiliar with p values and their meaning, I provide Appendix 1 as a short guide to interpretation.

[9] Willig Declaration at 8.

[10] *Id*. at 24.

[11] I am not overly concerned that Dr. Willig's UNE price data post-dates (June 2002) the investment data (which ends in December 2001). Since UNE prices are constantly changing and investment decisions are forward-looking, it is reasonable that decisions may be based on expectations about future prices. I am concerned, however, that Dr. Willig's UNE price measure does not reflect the average UNE prices in place over the time frame that investment is being measured or how they have changed over time. Further, the justification for using the AT&T data, rather than other UNE price data, should not rest on whether it produces more statistically significant coefficients.

- Dr. Willig uses 4 dummy variables to capture the impact of differing regulatory regimes – I use one. Only one of his variables is statistically significant and his model already has an excessive number of independent variables for such a small data set. There is the additional problem that 4 dummy variables for 47 jurisdictions may single out particular states for different treatment in the analysis.
- Dr. Willig uses total state population to derive per capita investment. Since RBOCs serve only portions of each state, this is a somewhat inaccurate measure of the size of the RBOC serving area. The only state where there is a large discrepancy is Nevada, where Nevada Bell serves a minority of the state's population. I have adjusted the Nevada population (by removing Clark County) and Dr. Willig has not. This one observation has little impact on the results.

11. Dr. Willig finds the UNE-P variable to have a negative coefficient and a p value of .005 when compared to investment per capita. I find a negative coefficient with a p value of .02 for this relationship. Basically, we agree that it is highly likely that there is an inverse relationship between ILEC investment per capita and UNE-P prices. On the other hand, when explaining the drivers for total ILEC investment, the UNE-P price has a p value of 99%. A p value of 99% means that it is just as likely that UNE prices have a positive relationship with investment as an inverse one.

When comparing the Dr. Willig column with my replication, some of the coefficients are an order of magnitude or more different. Most likely this results from using different units of measurement (e.g., thousands of dollars versus dollars), though it is impossible to tell without actually comparing the data. The p values are more important to look at and these are similar in both columns, with two exceptions. Dr. Willig finds that net plant in service (per capita) has little relationship with investment (per capita), while I find a strong relationship. Dr. Willig finds that the labor share in FIRE (finance, insurance, and real estate industries) has a significant impact on per capita investment, while I do not. This may be due to the fact that I use average revenue per line (business and residential)

while Dr. Willig uses average residential revenue per line. My revenue variable will pick up some attributes of the business telecommunications intensity in a state.

12. The conclusion from the table is clear. I concur with Dr. Willig's finding that investment per capita may be inversely related to UNE-P prices. Nonetheless, that relationship is solely the result of using per capita investment as the dependent variable and not the result of any inverse relationship between UNE-P prices and total investment. In fact, the choice of investment per capita as the way to account for state size, rather than the more direct use of size as an explanatory variable for total investment, has no sound rationale. It may appear that investment per capita is a reasonable way to account for state size – but it is not. Given the conflicting results when total investment rather than investment per capita are used as the dependent variable, the use of the less direct measure (investment per capita) would need to be justified (which Dr. Willig has not done). The relevant public policy question is not concerned with how investment per capita is affected – but the effect of UNE-P pricing on ***total*** investment.

The fact that investment per capita is lower when UNE-P prices are higher only means that any increase in investment is not proportional to the population of a state – hence, investment per capita is lower. Surely, it is total investment that we are interested in. Appendix 1 contains the technical derivation of why investment per capita behaves differently than total investment in relation to UNE-P prices. There is no evidence of an inverse relationship between UNE-P prices and total investment in Dr. Willig's model. It is only an artifact of his misplaced focus on investment per capita.

13. Given that total investment is the correct dependent variable to analyze, the alternate model I provide in this testimony is more relevant to the inquiry in this proceeding. In addition to selecting a more appropriate dependent variable (i.e., total investment), I make a few additional modifications to Dr. Willig's reduced form model:

- I measure RBOC investment from the end of 1996 through 2001 rather than from the end of 1995 through 2001. The first year after the Act was enacted was a time of great uncertainty. The FCC did not issue the Local Competition Order until August 1996 and it was stayed in October. Upon passage of the Act, expectations were that RBOC long-distance entry was imminent: by the end of the year it was clear that would take substantially longer than originally thought. So, the time period 1997 – end of 2001 is a more accurate reflection of the impact of UNE prices on investment.
- I include state income rather than unemployment as an explanatory variable. Unemployment was far from statistically significant, and it appears that state income (median household income) is a better measure of state economic activity.
- RBOC investment occurs throughout a state, not only in urban areas. UNE-P prices are de-averaged, and while the majority of CLEC entry has been in urban areas, UNE-P is available throughout the states. I therefore use the statewide average UNE prices rather than the UNE-P price in the urban zone.
- I use the average of the UNE price set in the 1997 time frame and that in the 2001 time frame. Since investment is being measured over this time period, it is reasonable to use a measure of average UNE prices over the same period. The 1997 UNE prices are either the FCC proxy or the state arbitrated UNE loop rate (platforms of UNEs were not a reality in 1997). Dr. Willig examined the use of the FCC proxy (which was not significant in his models), but many states did not adopt the FCC proxies. By early 1997, many states had established their own UNE rates, which have subsequently been changed a number of times. In any case, Dr. Willig only looks at the FCC proxies and the UNE-P prices as *alternative* measures of UNE prices and does not model both as relevant to investment over the time period.
- I replace average revenue with the regulated price for basic residential service in a state.
- I drop out the HCPM and price cap variables – they had little or no explanatory power and use up scarce degrees of freedom in such a small dataset. In any case, their inclusion does not qualitatively alter these results.

A Better Reduced Form Model of Total Investment

Variable	Coefficient (p value)
Dependent: RBOC total investment 1997- EOY 2001	
Intercept	-2,217,900 (p=.0006)
FIRE	45,122 (p=.16)
Change in population (96-02)	37,182 (p=.0002)
96 population	.0723 (p<.0001)
Median HH income	28.185 (p=.01)
Average residential flat rate service price	17,580 (p=.10)
Average of UNE-P (statewide average) and 1997 UNE loop rates	20,835 (p=.08)
N	49
R^2	.7933
Adjusted R^2	.7637

Note that the UNE-P price variable, as an explanatory variable for total investment, is marginally statistically significant, and has become positive and grown fairly large in magnitude. The coefficient of 20,835 means that each $1 decrease in the average UNE rate is associated with a reduction of $20,835,000 (RBOC investment is measured in $ thousands) of average state RBOC investment over the 1997-2001, time period. ***In other words, each $1 decrease in the average UNE rate is associated with a nationwide decrease in RBOC investment of over $1 billion***. The p value of .08 means that there is a 92% chance that this coefficient reflects a real effect of UNE prices and not just random statistical variation. A 90% confidence interval for the UNE price effect shows that this effect is positive (lower UNE prices are associated with less RBOC investment).[12] [13]

[12] A 95% confidence interval includes zero, but is much more likely to show a positive than a negative correlation. The 90% confidence interval for the UNE price coefficient is (+1231, +40,439) and the 95%

The marginal statistical significance should not be surprising given the number of different ways that UNE-P prices can impact competitive entry and ILEC investment (as Section C and Appendix 3 will make clear), the number of independent variables that could impact investment, and the limitations of the data. An important limitation is that the RBOC investment is total investment and includes investments associated with implementation of the Act. These investments (in operation support systems, for example) are one-time investments and may mask the real underlying pattern of investment in a state. Absent estimates of these investments, disaggregated to the state level, it is not possible to get a better measure of state level RBOC investment.[14]

14. I have tried a large number of variations of this model using different sets of independent variables and different time periods and the UNE-P coefficient is consistently positive and of similar magnitude, implying there is a direct correlation between decreases in UNE prices and decreases in RBOC investment.[15] At the point estimate indicated in the table, the elasticity of RBOC investment with respect to the

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confidence interval is (-2770, +44,440). For the latter, we cannot rule out the value of zero, but at the same time it is possible that the magnitude of the UNE price effect is twice as large as the interpretation I give in this paragraph.

[13] Standard statistical practice calls for claims of significance to be supported by low p values – 10% or less. Often 5% is used as the standard for declaring results "statistically significant." In the case of the data here, we are not really dealing with a random sample – we have the entire set of RBOC data, but for a single time period. The usual practice is to pretend that the data was a random sample of some larger data set and investigate whether the findings are statistically significant in that context. Alternatively, we can take the finding in my table as fact for what happened over the 1997- EOY 2001 time period and draw no inferences about what this implies for the future.

[14] It is likely that compliance costs are positively related to the size of the state, and thus, probably have some inverse relationship with UNE prices. So, I would expect that if we had a pure measure of RBOC investment net of these compliance costs, they would either be less negatively correlated, or show a larger positive correlation, with UNE prices. In other words, the expectation is that compliance investments artificially contribute to the potential inverse relationship between RBOC investment and UNE prices.

[15] The positive association between UNE-P prices and RBOC investment is also supported by theory and other evidence: see Hazlett, T.W. and Havenner, A., "The Arbitrage Mirage: Regulated Access Prices with Free Entry in Local Telecommunications Markets," Review of Network Economics, Vol. 2, No. 4, December 2003.

UNE-P price is 1.07. This means that a 10 percent increase in UNE-P prices translates to a 10.7% **increase** in average state RBOC investment, *ceteris paribus*.

These results are reinforced by the analysis in the next section. Once we examine how UNE-P prices differentially affect facilities-based and non-facilities-based competitive entry, the impact of UNE-P prices on investment becomes clearer. Dr. Willig's analysis fails to distinguish between different forms of entry and thus yields spurious results.

C. The Structural Models

15. Dr. Willig offers a two-stage analysis to model how UNE prices can impact ILEC investment. In the first stage, UNE prices play a role in CLEC entry. In the second stage, CLEC entry impacts ILEC investment. His *Competitive Stimulus Hypothesis* posits the idea that lower UNE prices will promote competitive entry and this entry will cause ILEC investment to increase. He claims his analysis supports this hypothesis.

This structural approach is richer than the reduced form approach since it measures the method by which UNE prices impact investment rather than merely measuring the net correlation between the two. Dr. Willig's support, however, is based on an incomplete theory and a mis-specified empirical approach. These problems with his analysis are in addition to his continued use of investment per capita as the variable he seeks to explain. That particular measure of investment is no more sensible here than it was in the reduced

form approach. But, the problems with Dr. Willig's analysis go much deeper here – and the corrected story is quite different from the one he presents.

16. The simple notion that competition will lead ILECs to invest more is itself misleading. Common sense suggests that there are at least two countervailing influences: first, that competition may spur investment in order to preserve (or enhance) a firm's market share; and second, that increased competition decreases the return from any given investment, reducing the incentive to invest in those assets. Clearly, there may be a point beyond which increased competitive pressure will lead to decreased investment. If there is little perceived benefit of additional investment on a firm's declining market share, and the return on the added investment does not compensate for the cost of investing, it is logical that the incentive to invest has been reduced. In addition, the ability to finance investment may be reduced as a firm's market share and profit margin begin to decline significantly.

I provide a simple, stylized investment model in Appendix 2 that reveals that the effect of competitive pressure on investment is ambiguous. It may well be the case that the RBOCs, beginning with large market shares, will increase investment due to increased competitive pressure. A proper investment model must admit, however, the possibility that investment could either increase or decrease. My model permits this, leaving it to the empirical evidence to determine which effect dominates.

17. I find considerable support for the proposition that increased competitive pressure has increased RBOC investment. That conclusion applies strongly to facilities-based competitive entry, and more weakly to UNE-P entry. Crucially, UNE-P prices affect these two forms of entry differently. Lower UNE-P prices are associated with less facilities-based entry, but with (possibly) more UNE-P entry. The net effect on RBOC investment is clearly detrimental: **lower UNE prices decrease RBOC investment**. Dr. Willig's model is incapable of reaching this conclusion by design, as I will demonstrate.

18. The structural model proceeds in two stages. The first stage examines CLEC entry as a function of UNE-P prices, among other factors. The second stage then relates ILEC investment to CLEC entry, among other factors. Dr. Willig's second-stage results are plagued by the same problem as above: the incorrect dependent variable (investment per capita rather than total investment). Still, my results will confirm that competitive entry is directly related to ILEC investment. The real problems with Dr. Willig's models lie in the definition and measurement of CLEC entry used in the first stage of his model.

19. It is important to realize that Dr. Willig only measures aggregate CLEC entry and not the different types of CLEC entry. Further, he offers two measures of CLEC entry: the natural logarithm of the number of CLECs in each state, and the share of zip codes in each state in which there is at least one CLEC. Neither of these is a suitable measure of CLEC entry since the number of CLECs or the geographical reach of those CLECs is quite different from the share of customers they actually serve.[16] In fact, excessive

[16] I have written about this problem elsewhere: see D.E. Lehman, "(How) do regulated prices affect competitive entry?" *Info*, Vol. 5, No. 4, 2003.

numbers of entrants and/or overextended geographical reaches may actually be associated with less actual market share. Since the FCC reports data on each of the forms of competitive entry, I will use the actual number of customers served by CLECs through various types of entry as my measures of CLEC entry. This change only mitigates one of the serious problems with Dr. Willig's formulation of the first stage CLEC entry model.

20. Dr. Willig presents 10 models for each of his two measures of CLEC entry. The 10 models of the log of the number of CLECs have sample sizes that range from 44 to 47 and an average R^2 of .35. The 10 models of the share of zip codes with CLEC service have sample sizes ranging from 45 to 48 and average R^2 of .22 (both R^2 and adjusted R^2). He does not explain the variation in the sample sizes, but since most of his models test different sources for UNE prices, my guess is that some of these data series are more complete than others. It is the R^2, the degree of fit, which causes concern. Despite his use of 6 independent variables in these equations, none of these measures the size of the state. It turns out that state size is the single most important determinant of the extent of CLEC entry. Given the poor explanatory power of these models, the omission of the single most important factor is a serious error.

To summarize the problems with Dr. Willig's CLEC entry models:

- Dr. Willig uses poor measures of actual CLEC entry where more direct measures are available.
- Dr. Willig's models have poor explanatory power and omit the most important determinant of CLEC entry – state size.

- Dr. Willig's models do not distinguish between facilities-based and non-facilities-based entry.

I correct for these deficiencies in the following analysis.

21. Using publicly available FCC data, I model complete facilities-based CLEC entry, UNE platform CLEC entry, UNE loop based entry (with CLEC provided switching), and CATV broadband modem subscriber entry. The last serves as a proxy for the extent of cable investment in each state, since successful cable modem deployment requires significant network investment. This permits a test of how such facilities-based entry is impacted by UNE-P prices. All of this data is somewhat incomplete – the FCC does not report data where there are so few CLECs that revealing the state level data would provide someone the ability to derive the proprietary company-specific data. These are generally smaller states. I also report on models with Dr. Willig's two measures of CLEC entry for which more complete (but less useful) data is available.

For each of my measures of CLEC entry, I run the same model: entry is a function of state population, population growth 1996-2002, median household income in each state, the FCC proxy measure of loop costs (HCPM), and the UNE-P price variable (the average of the early loop UNE price and the 2001 UNE-P price). All of the CLEC entry measures are as of 12/31/2001. The results are given below:

CLEC Entry Models
Model Coefficients with (p values)

Independent variable	Dependent Variable					
	Facilities lines	Cable broadband lines	UNE lines without switching	UNE-P lines	Ln # CLECs	Share zips with CLECs
Population	.028 (p<.0001)	.033 (p<.0001)	.014 (p<.0001)	.031 (p=.0003)	$7x10^{-8}$ (p<.0001)	$1.4x10^{-6}$ (p=.03)
Change in population	-454 (p=.23)	-752 (p=.74)	-3077 (p=.02)	-6693 (p=.47)	.026 (p=.15)	1.72 (p=.03)
Median HH income	7.23 (p=.04)	11.7 (p=.0004)	1.86 (p=.18)	13.27 (p=.21)	$-2x10^{-7}$ (p=.99)	.003 (p=.0007)
HCPM	-7563 (p=.15)	-5720 (p=.25)	-2630 (p=.10)	-2573 (p=.85)	-.03 (p=.31)	2.31 (p=.05)
UNE-P price	11,195 (p=.01)	9228 (p=.003)	746 (p=.64)	16,261 (p=.170	-.05 (p=.03)	-.33 (p=.74)
Constant	-305,449 (p=.16)	-433,650 (p=.02)	1853 (p=.98)	-708,654 (p=.25)	2.86 (p=.02)	-106 (p=.05)
N	37	40	49	47	45	46
R^2	.85	.93	.86	.35	.63	.48
Adjusted R^2	.83	.92	.84	.27	.59	.42

A number of important observations:

- The last two columns contain Dr. Willig's measures of CLEC entry. The dramatically different behavior of these variables with respect to UNE prices illustrates that the number of CLECs and their geographical reach is quite different from the actual customers they serve. My results also differ from what he reports, but this is primarily due to my inclusion of population as an explanatory variable (it is highly significant and considerably improves the overall fit of the model). If I omit the population variable, my results look much like his - highly significant with a negative coefficient on the UNE price variable. However, the analysis shows that this model has very poor explanatory power in explaining CLEC market entry (low R^2).
- The similarity between my models of facilities-based entry (the first three columns) is striking – particularly for the first two measures of complete facilities-based entry. The models are strong and the impact of UNE-P prices is highly significant, positive, and large in magnitude (elasticities exceeding unity). There is significant likelihood that higher UNE prices will result in greater facility-based CLEC entry into the market. As opposed to Dr. Willig's analysis, increases in UNE prices play a significant role in explaining increases in facility-based entry, for carriers not using unbundled loops.
- The equation for determining market entry for carriers using unbundled loops (without switching - not the platform) does not show significance of the UNE

price variable. This may be due to my UNE price variable being based on the UNE platform price (rather than the UNE loop rate) in 2001 or it may be due to the more complicated nature of modeling this mixed form of entry.

- The UNE-P entry model is extremely poor in comparison with the other forms of entry. In fact, the UNE price variable (while not statistically significant) is positive, contrary to intuition - these counterintuitive results, combined with the poor explanatory power, suggest an omitted variable problem. In fact, I have identified a likely candidate: the impact of 271 approval. If I include the number of months until 271 approval (from the enactment of the Act, measured as of December 31, 2001), then the adjusted R^2 increases from .35 to .75, the 271 variable is large (-51,798), negative, and highly significant ($p<.0001$), and the UNE price variable becomes negative and fairly large (-8517) though not quite significant ($p=.26$). This suggests that the length of time to 271 approval may be a more significant determinant of UNE platform use than is the price of the platform. It is consistent with strategic CLEC behavior that may have delayed use of the UNE platform while RBOC 271 approval in a state was in question.[17] In any case, the fact is that UNE-P entry is more difficult to explain than is facilities-based entry. Since the effect of UNE prices on the latter is clear (lower UNE prices are associated with less facilities-based entry), any evidence of a counterveiling effect on UNE-P entry appears to be much weaker.[18]

22. These results strongly support the hypothesis that low UNE prices *may* stimulate UNE-P entry, but this is certainly at the expense of facilities-based entry. This leads to the second stage of the estimation: how do these forms of entry affect ILEC investment? I will focus on the two pure forms of facilities-based entry and entry using the UNE platform (including the 271 variable, as it produces a far superior model). For each of these variables, I estimate the 1997-end of year 2001 RBOC investment as a function of the 1996-2002 population change, the price cap variable (to see whether price cap regulation affects investment – it seems to have more explanatory power in these models than in prior models and does not materially affect the other coefficients of interest), and

[17] See, for example, Lehman, D.E. and Weisman D., *The Telecommunications Act of 1996: The "Costs" of Managed Competition*, Kluwer Academic Publishers, 2000, Chapter 7.

[18] To the extent that UNE-P entry is not clearly helped by lower UNE prices, any subsequent effect of stimulating ILEC investment is also weakened.

the estimated competitive entry from the first-stage model. These results are presented here:

CLEC Entry and RBOC Investment

Independent variable	Dependent Variable = RBOC Investment (1997-EOY 2001)		
	Facilities entry	Cable modem entry	UNE platform entry
Price caps	160,439 (p=.27)	154,537 (p=.21)	31,603 (p=.80)
Change in population	52,050 (p=.0001)	42,321 (p=.0002)	50,150 (p<.0001)
Estimated 1st stage entry variable	2.48 (p<.0001)	2.05 (p<.0001)	1.46 (p<.0001)
Constant	-409,016 (p=.03)	-396,363 (p=.01)	-160,728 (p=.28)
N	37	40	49
R^2	.75	.78	.69

Observations from this table:

- There is strong evidence that facilities-based competitive entry spurs RBOC investment. There is also a positive association between UNE-P entry and ILEC investment.[19] Crucially important, however, is the fact that RBOC investment is more strongly associated with facilities-based entry than with UNE-P entry. This is seen by the coefficients on the estimated first stage entry variables. The positive values indicate that investment rises with entry in each of these forms. In the first stage we found that higher UNE prices lead to greater market entry by facility based CLECs. Here we find that facilities-based entry has the strongest relationship to increased RBOC investment.
- Population change remains an important determinant of RBOC investment, even after accounting for CLEC entry.
- Price cap regulation is not statistically significant but is showing some sign of enhancing RBOC investment.

23. The first point is the critical finding. It can be reinforced by including both facilities-based and UNE-P entry in the same equation (the two forms of facilities-based entry are so similar that inclusion of both would entail severe multicollinearity, so I will use only

[19] It is important to note that these results show associations between variables, *holding all other variables constant*. In other words, the positive association between UNE-P entry and ILEC investment assumes that there is no change in facilities-based entry at the same time. See the next model for results on this point.

the broadband entry as it has a larger sample size). A further addition to this model is to include the change in UNE loop rates from 1997 to 2001 (mostly these declined). This model is summarized in the following table:

Structural Equation for RBOC Investment

Variable	Coefficient (p value)	p value
Change in population	41,774	<.0001
Estimated cable broadband entry	1.37	<.0001
Estimated UNE-P entry	0.80	<.0001
Price cap (=1 for price cap states)	101,112	.34
Change in UNE loop rate	-18,328	.0475
Constant	-302,456	.02
N = 40; R^2 = .86; adjusted R^2 = .84		

Here, we see that both types of entry promote RBOC investment (holding the other variables constant), but that facilities-based entry has a much larger effect on investment than does UNE-P entry. Given that lower UNE prices enhance UNE-P entry but undermine facilities-based entry, the implication is clear: low UNE prices inhibit RBOC investment. There is also evidence that the degree to which UNE prices have declined over time has had an adverse impact on RBOC investment. Dr. Willig does not permit the level of UNE prices to impact RBOC investment, other than through the competitive entry variables, and he does not include consideration of the changes in UNE prices at all. Here, we see that there is an impact independent of competitive entry. This is consistent with a view that capital markets have perceived the reductions in UNE prices as an increase in risk.

24. Dr. Willig's model, of course, could not capture the effects of UNE prices on the different types of CLEC entry, and thus, on RBOC investment. He only looked at CLEC entry (and measured that by the number of CLECs rather than their actual provision of service). My results make it clear that low UNE prices affect different forms of entry differently. There is a tradeoff – exactly the tradeoff expected from the model in Appendix 3. Low UNE-P prices promote entry using the UNE platform but at the expense of facilities-based entry. The net effect is to reduce ILEC investment. It also reduces CLEC facilities-based investment.

25. **Conclusion**

The conclusion resulting from my analysis is clear. Low UNE prices inhibit both RBOC and CLEC investment, while increases in UNE prices can be expected to stimulate both. Dr. Willig's contrary results are the product of mis-specifying the dependent variables – using investment per capita in place of total investment and using the number of CLECs in place of actual CLEC service provided. Once the dependent variables are properly specified, the flaws in his conclusions become clear, and the corrected results comport with both theoretical expectations and marketplace evidence.

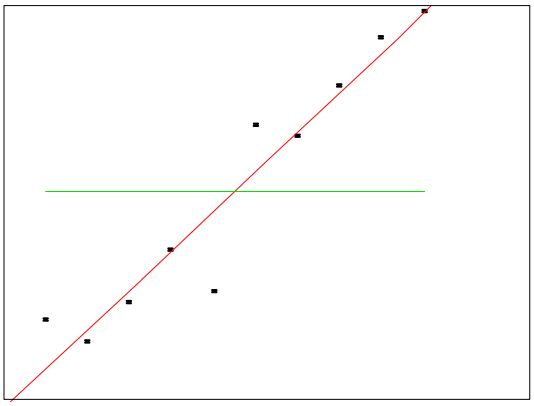
Appendix 1: A Primer on P Values and Statistical Significance

Much of my analyses and those of Dr. Willig rely on findings of statistical significance for regression model coefficients. This appendix is a brief explanation of p values as a guide to statistical significance for readers not familiar with these concepts. Any introductory statistics textbook will provide a more complete and technical description of inference in regression models. This is intended as an intuitive elementary explanation of inference in regression modeling, with particular emphasis on the interpretation of p values.

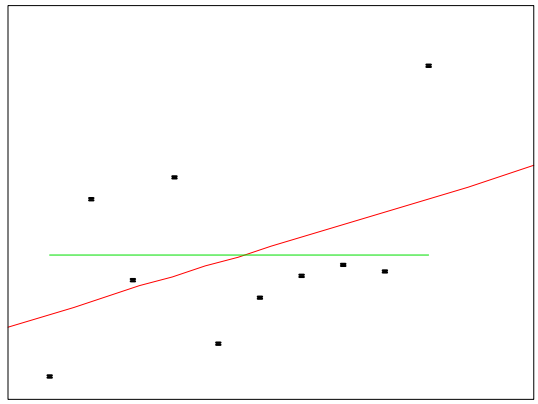
The models discussed in my testimony employ multiple regression analysis: several independent variables (X) are used to account for the variation in a dependent (Y) variable. In the following I will refer to a single X variable so that the model can be visualized – extension to multiple X variables is straightforward. Suppose we have data consisting of a sample of X and Y values and we wish to determine whether there is evidence of a linear relationship between X and Y. Graphically, our data is a scatterplot of these values.

Regression inference begins by hypothesizing that there is no relationship between X and Y (commonly referred to as the "null hypothesis") and then asking whether we have sufficient enough evidence of a relationship with which to reject that hypothesis. This involves the following two steps: (i) estimating the relationship between X and Y present in the sample data by fitting a line as close as possible to the sample points, and then (ii) assessing whether the slope of this line is sufficiently different from a horizontal line (horizontal because it would show that variations in X do not affect Y: this is the hypothesis being tested) compared with the variation of the points around the line. If the slope is large compared with this variation (figure (a) below) then it is convincing evidence that the relationship is more than simple random sample variation. On the other hand, if the slope is small relative to the variation of the points around the line (figure (b)), then we do not find convincing evidence that the relationship is real, rather than simple random sampling variation:

(a) strong evidence of a relationship



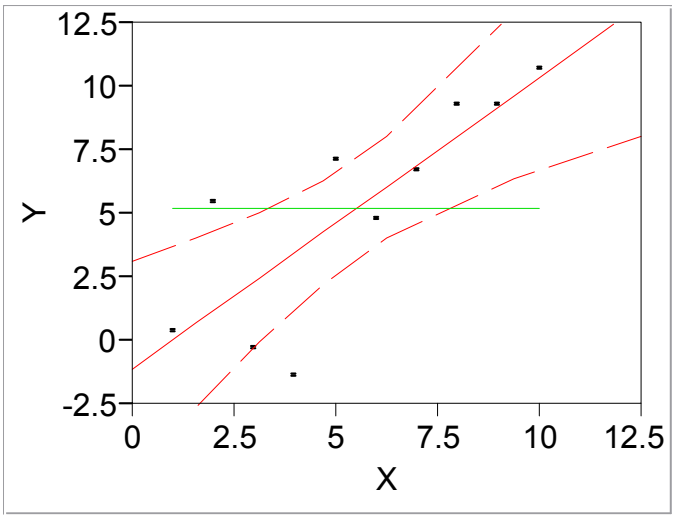
(b) weak evidence of a relationship



Note that the variation of the points around the sloped line is small compared to the difference between the sloped line and the horizontal line in (a). In (b), the points are widely scattered around the sloped line compared with the difference between the sloped and horizontal lines. In (a) we are inclined to believe the relationship is real and not just random sampling variation; in (b) we are not convinced – in other words, we are unable to reject the null hypothesis.

In the figure below, I show some sample data and the hypothesis we are investigating, shown as the horizontal line:

Example *X-Y* Scatterplot, with Least Squares Regression Line



The horizontal line represents the hypothesis of zero effect.

The solid sloped line is the best fitting regression line through the data points.

The dashed lines represent a 95% confidence interval for the best fitting line.

Statistical significance is represented by the fact that the horizontal line is not contained within the confidence interval.

The equation for the best fitting regression line is:

$Y = -1.110171 + 1.1464919\ X$

Of particular relevance to this appendix is the assessment of statistical significance, which comes out of a table such as the following:

Parameter Estimates

Term	Estimate	Std. Error	t Ratio	Prob>|t|
X	1.1464919	0.29568	3.88	0.0047

The slope ("Estimate" for *X*) is 1.1465. This measures how changes in *X* affect *Y*: each change of one unit of *X* is associated with a 1.1465 change in *Y*, in this example. A measure of the variation of the points around this line is the standard error ("Std Error") of .296. Historically, economists have reported the slope and its standard error (this is what Dr. Willig reports), or alternatively, the slope and the t-Ratio. The t-Ratio measures how many standard errors away from zero the estimated slope is (Estimate divided by Std. Error). In this example the slope of 1.1465 is 3.88 standard errors (.296) away from zero. This means that we have found a slope that is 3.88 standard deviations away from the hypothesized no relationship slope of zero. How likely is that?

The answer is given by the p value ("Prob>t"). Statistical theory leads us to believe that the estimated slope will follow a t distribution (very similar to a normal distribution, the "Bell-Shaped" curve). If the true relationship between *X* and *Y* is one of no relationship (i.e., a slope of zero), then our data suggests a relationship that is so far from zero as to have only a .0047 chance of occurring due to random sampling variation. This is a sufficiently small probability to reject the null hypothesis – the hypothesis of no relationship between *X* and *Y,* and conclude that we have statistically significant evidence of a relationship.

I report the p values in my analyses while Dr. Willig reports the standard errors.[20] For comparison, I have converted his standard errors into p values. The benefit of p values over standard errors is that they directly report the likelihood that the estimated effect is

[20] This historical practice of reporting either standard errors or t statistics, rather than p values, results from the fact that it used to be very costly to generate estimates of the precise p values. Advances in computing power over the past 20 years have made it commonplace to report the p values directly.

the result of random sampling variation rather than representing a real effect. In figure (a) above, the p value was less than 1% while in (b) it was 20%.

Alternatively, the p values can be interpreted in terms of confidence intervals. In my Example, a 95% confidence interval for the true slope of the X-Y relationship is (0.46, 1.83). This is a symmetric interval centered on the estimated slope of the regression line (1.1465). The fact that it does not include zero reflects the fact that the p value is less than 5%: since there is less than a 5% chance that the slope could be that different from zero, an analogous statement is that a 95% confidence interval for the slope does not include zero. Also shown in the graph is a representation of this confidence interval for the slope, shown as the dashed lines. The statistical question is whether these dashed lines enclose the horizontal line or not (does the 95% confidence interval include the zero effect hypothesis?).

When reviewing the statistical results in my declaration, all the p values reveal the likelihood that we could get a relationship as strong as that found in our sample, under the hypothesis that there is no relationship between the dependent and independent variables, only random sampling variation. For example, the table in paragraph 10 above indicates a coefficient for the UNE price of 20,835 and a p value of .08. The coefficient means that each $1 change in the UNE price is associated with a change (in the same direction) of $20,835,000 of 1997-02 RBOC investment (since investment is measured in $ thousands). The p value of .08 means that there is only an 8% chance that an effect this large could result from random sampling variation, if there really is no effect of UNE prices on investment. In other words, it is highly unlikely. Alternatively, there is a 92% chance that changes in UNE prices are directly associated with changes in investment.

Appendix 2:

How Do UNE Prices Impact Investment and Investment *Per Capita* Differently?

The purpose of this appendix is to explain why UNE prices impact per capita investment (which Dr. Willig does analyze) and total investment (which he does not analyze) behave differently. Clearly, investment is a function of population. It may also be a function of UNE-P (the price of the UNE platform) – that is, the relationship being estimated in the reduced form equations. I will write I = f(POP,UNE-P) as the investment function. Per capita investment, then, is f(POP,UNE-P)/POP. More formally, we are interested in the derivative of f(POP,UNE-P) and [f(POP,UNE-P)/POP] with respect to UNE-P.

Clearly these will have the same sign if POP is unrelated to UNE-P. That is, if higher UNE-P is associated with higher (lower) ILEC investment, then it will be associated with higher (lower) ILEC investment per capita. If there is a relationship between POP and UNE-P, however, this need not be the case. Suppose POP is a function of UNE-P, POP(UNE-P) – in fact, there is a relationship. It is not statistically significant, but it has a sizeable magnitude: larger states have set somewhat lower UNE-P prices. The issue here is not one of statistical significance, but one of whether we need to empirically account for the relationship. With POP(UNE-P), consider the derivative of per capita investment with respect to UNE-P:

$$\frac{\partial \dfrac{I(POP(UNEP),UNEP)}{POP(UNEP)}}{\partial UNEP} = \frac{POP(POP'\partial I/\partial POP + \partial I/\partial UNEP) - I\,POP'}{UNEP^2}$$

Dr. Willig finds that this entire derivative is negative: higher UNE-P is associated with less investment per capita. I verify his finding, but I find that $\partial I/\partial UNEP > 0$, that total investment rises with increases in UNE-P. Can these two findings be consistent?

The answer is yes, since the sign of the derivative of investment per capita with respect to UNE-P is ambiguous. Investment is positively related to population and population and

UNE-P are inversely related, so the first term is negative. The second term I find to be positive. The last term is also positive. So, the entire derivative will be negative (as Dr. Willig finds) provided that there is a sufficiently large inverse relationship between population and UNE-P.

Dr. Willig's inverse relationship between UNE-P and investment per capita disappears if the dependent variable is total investment. My improved specification of the reduced form equation for total investment shows a positive relationship between investment and UNE-P price levels. Thus, the behavior of investment and investment per capita is quite different in relation to UNE-P.

While this discussion has been somewhat technical, the intuition is clear:

- Investment per capita is not as straightforward to model as is total investment. According to Dr. Willig's paper, "Dividing by state population controls for differences in the level of ILEC investment due to differences in the size of a state."[21] Apparently not. Using investment per capita as the dependent variable complicates things considerably, since its behavior is more subtle than directly modeling investment (as a function of state size, among other factors).
- The fact that per capita investment is inversely related to UNE-P prices tells us little. Total investment may rise with higher UNE-P prices (as it does) even as investment per capita falls. All that is required is that total investment rises (due to the UNE-P price effect) by less than the state's population – the result will be a drop in per capita investment. In this case, investment has risen (at higher UNE-P prices), and that is the real story. The fact that it has risen less than proportionally to state population means little.

[21] *Stimulating Investment and the Telecommunications Act of 1996*, Robert D. Willig, William H. Lehr, John P. Bigelow, and Stephen B. Levinson, October 11, 2002, AT&T ex parte, CC Docket Nos. 01-338, 96-98 and 98-147, at 13.

Appendix 3: A Stylized Theory of ILEC Investment and UNE-P Prices

The purpose of this appendix is to formulate a simple model that explores how competitive entry may impact ILEC investment incentives. I will derive expectations for whether the relationship between competitive entry and ILEC investment should be positive or negative. The theoretical prediction turns out to be ambiguous. The empirical results in section C show that increased competitive entry will lead to more ILEC investment. This is true for both facilities-based and UNE-P entry, but my theoretical model suggests that this stimulus effect should be stronger for facilities-based entry.

I also show how low UNE-P prices impact ILEC investment due to their differential effect on facilities-based entry and UNE-P entry. Lower UNE-P prices may enhance UNE-P entry but at the expense of facilities-based entry. The net effect is an empirical question – but the evidence is clear that the deleterious impact on facilities-based entry is the stronger effect.

I model the basic investment decision as follows. I represents total ILEC investment. I formulate a two-period model in which I is an expense incurred now in order to yield benefits next year. The benefits take two forms. First, net revenues, $R(I)$, will increase with investment. Development of new products and/or cost-reducing processes will result in higher net revenues, but subject to diminishing returns. In formal terms, $R'(I)>0$ and $R''(I)<0$. The second impact of investment is that market share S will be an increasing function of investment, also subject to diminishing marginal returns. Market share is also a function of facilities-based entry, F, with a negative partial derivative with respect to facilities-based entry. Formally, $S(I,F)$ with $S_I>0$ and $S_F<0$.[22]

Then, with r representing the discount rate, profits as a function of investment will be:

[22] I will ignore the second order derivatives but I will assume that all required regularity and continuity assumptions are satisfied. My focus is to derive expectations for the impact of competitive entry on investment incentives under conditions where there are no "special cases" that would require more complicated modeling (e.g., such as nonconvexities, discontinuities, etc.).

$$\Pi(I,F) = -I + \frac{1}{1+r}\big(R(I)S(I,F)\big)$$

The necessary first order condition (FOC) for profit maximization with respect to investment is then

$$\frac{1}{1+r}\left[R'S + RS_I\right] = 1$$

This FOC has the usual marginal benefit equals marginal cost interpretation: the marginal cost of investment is $1 and optimal investment equates the marginal benefit to this marginal cost. The marginal benefit takes two forms: first, increased revenues for the firm's market share, and second, increased market share from which to earn net revenue. Given the appropriate second order effects, this is a unique optimal investment level.

The issue is: how does facilities-based competitive entry impact the optimal investment level I^*? By the implicit function theorem,

$$sign\frac{\partial I^*}{\partial F} = sign\frac{\partial FOC}{\partial F} = sign\left[R'\frac{\partial S}{\partial F} + R\frac{\partial^2 S}{\partial I \partial F}\right]$$

There are two terms. The first is negative, as facilities-based entry decreases the incumbents' market share (and thus, the marginal return from revenue enhancements). The second term is plausibly positive, as increased facilities-based entry raises the marginal benefit of investment in terms of market share enhancement. It is reasonable to believe that the second term predominates in the earlier stages of competitive entry since the novelty of facilities-based competitive entry may make ILEC investment an extremely productive (and necessary) competitive tool. At least, that appears to be consistent with the story that Dr. Willig tells in the *Competitive Stimulus Hypothesis*.

It is important to emphasize that the effect of competitive entry on ILEC investment is theoretically ambiguous. Dr. Willig's story is too simplistic, as commonsense tells us. Increased competitive entry need not always lead to increased ILEC investment. If the incumbent's market share drops sufficiently, then the returns from such investment might eventually fall. It is plausible to believe that the relevant practical result of increased

facilities-based entry, at this point in time, will be to increase ILEC investment, and the empirical results bear this out.

It is also important to recognize that I have omitted any effect of competitive entry on the cost of capital. Arguably, the increased risk could cause r to rise, leading to another investment-reducing force.

How do UNE-P prices affect these results? The simplest way to incorporate UNE-P prices is to make facilities-based entry a function of UNE-P prices, F(UNE-P), with $F' > 0$. Since UNE-P is a substitute form of entry for facilities-based entry, higher UNE-P prices would lead to increased use of facilities-based entry. The derivation of $\partial I^* / \partial UNEP$ proceeds as above, with F' multiplying both terms above. Then, UNE-P will have the same directional impact on ILEC investment as facilities-based entry, since UNE-P and facilities-based entry are assumed to be positively associated.[23]

The expectation, then, is that higher UNE-P prices will be associated with greater facilities-based entry and that such increased competitive pressure will be associated with higher ILEC investment. This is exactly what the empirical results tell us.

What about UNE-P entry? The investment model must be modified slightly, as there are now additional revenues and costs associated with such entry that are not associated with facilities-based entry. Entrants using UNEs provide a revenue stream as well as impose costs associated with the provision of these elements. The model is very similar to that for facilities-based entry, with F replaced by U, the level of UNE-P entry. Naturally, U(UNE-P), with the expectation that $U'<0$; that is, there will be less UNE-P entry at higher UNE-P prices. Now, profits are

[23] For those that would maintain that UNE-P entry and facilities-based entry are complements rather than substitutes, the opposite result would be expected. That is, higher UNE-P would lead to reduced facilities-based entry, and that (possibly) to reduced ILEC investment. It is not important that the substitutable or complementary relationship between the two forms of entry be decided *a priori* – the empirical results will make clear that these are substitutable forms of entry.

$$\Pi(I,UNEP) = -I + \frac{1}{1+r}\left[R(I)S(I,U(UNEP)\right] + (UNEP - K)U(UNEP)$$

The last term is new (K represents the per unit cost of providing the UNE-P) and represents the net profits from UNE-P entry. This new term may be positive or negative, but will not figure in the results below, since it affects the level of profits but not the level of investment. Of course, the level of profits may impact the cost of capital, but this is not included in the model presented here. To the extent that UNE-P prices are below cost, and to the extent that the use of this platform leads to a higher cost of capital for the ILEC, investment would be reduced at lower UNE-P prices (and raised at higher UNE-P prices), *ceteris paribus*.

Proceeding as before, the sign of $\partial I^* / \partial UNEP$ will be the same as the sign of the derivative of the first order conditions with respect to UNE-P, or

$$sign\left[R'\frac{\partial S}{\partial U}U' + R\frac{\partial^2 S}{\partial I \partial U}U'\right]$$

As before, this is ambiguous. If we expect UNE-P entry to impart a competitive stimulus to ILEC investment (as Dr. Willig would suggest), then we expect the second term to dominate, with the result that the sign of the above expression is negative. There is an important difference, however. The ability of investment to promote market share is attenuated with UNE-P competition compared with facilities-based competition, since UNE-P entry enables competitors to share the benefits of network investment. This means the magnitude of the second term (the positive one) is reduced. Thus, the case for a competitive stimulus effect is weaker with UNE-P entry than with facilities-based entry.

The effect of changes in UNE-P prices is the opposite of the result for facilities-based entry, because the effect of UNE-P prices on the two types of entry is different. Whereas higher UNE-P prices would be expected to enhance facilities-based entry, it would be expected to impede UNE-P entry. If we assume that both types of competitive entry impart a competitive stimulus, then we would expect higher UNE-P prices to lead to

more ILEC investment on one hand (through its effect on facilities-based entry) and less ILEC investment on the other (through its effect on UNE-P entry).

Which story prevails is an empirical question. The results in section C clearly suggest that UNE-P prices affect facilities-based entry and UNE-P entry differently. The empirical results in section C also show that facilities-based entry is a more powerful stimulant to ILEC investment than is UNE-P entry. The net effect on ILEC investment is that higher UNE-P prices are associated with greater ILEC investment (and *vice versa*).

REPLY DECLARATION OF

DENNIS L. WEISMAN[1]

January 30, 2004

I. Introduction

1. This Reply Declaration is a follow-up to my earlier Declaration entitled "The Theoretical Economic Principles Underlying TELRIC" that was filed in this docket on December 16, 2003. The primary objective of this Reply Declaration is to respond to the recommendations espoused by opposing parties in this docket concerning the measurement of TELRIC and its economic and public policy implications.

2. The Preamble of the Telecommunications Act provides the Commission with a succinct statement of Congressional intent concerning the primary objectives of the statute. The Preamble is abundantly clear that Congress was principally concerned with promoting competition, reducing regulation and encouraging investment in telecommunications infrastructure:

> To promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.[2]

In my Declaration, I observed that "The Commission's efforts to implement this complex, multi-faceted and sometimes vague legislation have been nothing short of extraordinary."[3] Moreover, particularly where there is uncertainty over Congressional intent and there are multiple objectives, a reliance upon the Preamble of the Telecommunications Act may, in some cases, provide useful clarity.[4]

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[1] Professor of Economics, Kansas State University. The views expressed herein are exclusively my own.

[2] Preamble, 1996 Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (Feb. 8, 1996) (codified as amended in scattered sections of 47 U.S.C.).

[3] Weisman Declaration at ¶ 2.

[4] *Triennial Review Order* at ¶ 70.

3. In my Declaration, I also articulated a set of economic principles that I believe should inform the Commission's deliberations on the development of TELRIC in a manner that is consistent with sound economic principles, good public policy and Congressional intent. I restate these principles here for future reference in the discussion that follows.

> ***Principle 1.*** TELRIC should not distort the "build or buy" decision of rivals in determining their respective entry strategies in the local telephone service market.
>
> ***Principle 2.*** The default costing standard for the proper measurement of TELRIC is a long-run, forward-looking cost standard that reflects the actual network characteristics of the ("presumptively efficient") incumbent provider.[5]
>
> ***Principle 3.*** Costs must have objective reality in the sense that TELRIC measures should comport with the facts on the ground.
>
> ***Principle 4.*** Pure price cap regulation (relative to traditional, rate-of-return regulation) provides the incumbent provider with incentives for efficiency that more closely approximate those of a competitive marketplace.
>
> ***Principle 5.*** Whatever problems and informational asymmetries may attend the use of the incumbent provider's actual, forward-looking costs, they are far outweighed by the inherent (un)verifiability of hypothetical TELRIC.
>
> ***Principle* 6.** The incumbent provider's incentive to misreport its costs is not unequivocal.
>
> ***Principle 7.*** The use of hypothetical TELRIC gives rise to a paradox in which the incumbent firm can be underpriced (foreclosed) by a less efficient rival using the incumbent firm's own network.
>
> ***Principle 8.*** Economic efficiency requires that the price for a good or service reflect the actual resource costs borne in producing that good or service. An immediate corollary to this principle is that efficiency requires that the structure of prices reflect the structure of costs.

4. As the Commission effects changes to the methodology underlying TELRIC, it is important to recognize that the Telecommunications Act did not empower

[5] The term "default" in this context means that the proper standard should be a long-run, forward-looking cost methodology that reflects the actual network characteristics of the incumbent provider—absent credible marketplace evidence to suggest that an efficient incumbent provider operates otherwise.

the Commission to implement a new form of regulation, but rather to implement a deregulatory act. This distinction is critical. Traditional forms or regulation seek to emulate a competitive market outcome.[6] A regulator, whether it be through some form of traditional, rate-of-return regulation or price cap regulation, serves as a surrogate for the marketplace. In contrast, a deregulatory act seeks to foster a competitive process that reduces (or eliminates altogether) the role of the regulator. In implementing the Telecommunications Act, the Commission has been empowered by the Congress to "accommodate" would-be entrants in a manner that will ultimately lead to reduced regulation and perhaps even a sunset for regulation. I would respectfully submit that the Commission should take great care not to confuse its responsibilities as a market facilitator with those of a traditional regulator.[7]

5. Indeed, the roles of the traditional regulator and that of the market facilitator are as different as centrally-planned economies are from market economies. Justice Breyer spoke eloquently of this distinction in his dissent in *Verizon v. FCC.*

> The Telecommunications Act is not a ratemaking statute seeking better regulation. It is a deregulatory statute seeking competition. It assumes that, given modern technology, local telecommunications markets may now prove large enough for several firms to compete in the provision of some services – but not necessarily all services – without serious economic waste.[8]
>
> But the problem before us – that of a lack of "rational connection" between the regulations and the statute – grows out of the fact that the 1996 Act is not a typical regulatory statute asking regulators simply to seek low prices, perhaps by replicating those of a hypothetical competitive market. Rather, this statute is a deregulatory statute, and it

[6] Alfred E. Kahn, *The Economics of Regulation*, New York: Wiley, 1971, p. 17; James C. Bonbright, *Principles of Public Utility Rates*, Columbia University Press: New York, 1961, Chapter 6.

[7] In its brief before the United Supreme Court in *Verizon v. FCC*, the Commission did not distinguish between implementing a new form of regulation and implementing a deregulatory act. For example, in defending its position on TELRIC, the Commission observes that "A primary objective of rate regulation, however, is to establish the price that would exist in a fully competitive market." Federal Communications Commission Brief in *Verizon v. FCC*, July 2001, p. 17. The Commission goes on to observe that "The central objective of rate regulation has traditionally been to restore the 'true' market price – the price that would result through the mechanism of a truly competitive market." *Id.* at 29.

[8] *Verizon v. FCC*, 535 U.S. 467, 543 (2002).

> asks regulators to create prices that will *induce appropriate new entry* (emphasis added).[9]

6. The opposing parties in this proceeding have argued that this is a distinction without a difference in the case of unbundled network elements because network elements are unbundled only where competition is infeasible.[10] This is a fundamentally incorrect reading of the Commission's Triennial Review Order (TRO). The TRO does not call for a finding of impairment and hence unbundling where competition is necessarily infeasible, but merely where competition has not yet materialized to a degree that would conclusively demonstrate otherwise.

7. This discussion underscores the slippery slope of so-called "efficient costs." There can be no credible claim that the incumbent providers (or any other firm for that matter) have necessarily eliminated all sources of "inefficiency" in their operations. This is particularly the case when "inefficiency" is measured, as it is under the CLECs' view of TELRIC, against the costs of a hypothetical firm that is building and operating a replacement network today using the most advanced technology currently available. Yet, there is every reason given the prolonged history under which the incumbent providers have operated under price cap regulation and the discipline imposed by the reality (and continuing threat) of intra- and inter-modal competition, that the incumbent providers have had strong incentives to eliminate to the maximum extent possible all known sources of inefficiency in their operations.

8. While it is certainly conceivable that additional efficiency improvements can be made, there is no "scientific" basis for discovering them outside of the competitive market conditions that the Act seeks to foster. The fact that there are recognized limits on the abilities of regulators to meaningfully evaluate efficiency and thereby implement competitive prices was the driving force behind price cap regulation.

> In fact, the widespread adoption of price cap regulation, not only in North America, but throughout the world, is a recognition on the part of

[9] *Id*. at 559.

[10] Willig Declaration at 114.

> regulators that they do not have sufficient information to do what the efficient-firm approach proposes to do.[11]

Thus, Congress intended that the marketplace and not the regulator serve as the *final arbiter* of efficiency under the Telecommunications Act.

9. Furthermore, as Professor Kahn observes, any attempt to predetermine the outcome of the competitive process serves only to undermine that process. In other words, we cannot know what constitutes so-called "efficient costs" outside of the competitive market process that gives rise to them.

> Just as in rate-cap regulation, competitive markets set prices on the basis (roughly speaking) of the costs of incumbents. Those prices give challengers the proper target at which to shoot—the proper standard to meet or beat and the proper reward if they succeed. If they can achieve costs lower than that, firms will enter and in the process beat prices down to efficient levels. The FCC's choice, of — omnisciently — prescribing at once what it thinks would be the *outcome* of such a process, *short-circuits* it: why would competitors undertake the risks of major investments in their own facilities if they can lease them from the incumbent firms at what regulators speculate would be the minimum costs that an ideally efficient firm would incur constructing them afresh?[12]

10. This discussion should not be construed to suggest that the incumbent providers should necessarily be given *carte blanche* with respect to the costs of provisioning unbundled network elements. It does suggest, however, that the Commission accord the proper weight to the fact that the incumbent providers have operated under price cap regulation for an extended period of time (*Principle 4*), that the incumbent providers face the reality (and increasing threat) of inter-modal facilities-based competition, and that the incumbent providers' incentives to misrepresent their costs are not unequivocal (*Principle 6*). Moreover, state commission actions in the course of TELRIC proceedings to prescribe "efficient costs," in the absence of any demonstrable

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[11] Dennis L. Weisman, "The (In)Efficiency of the 'Efficient-Firm' Cost Standard," *The Antitrust Bulletin*, Vol. XLV(1), Spring 2000, pp. 200-01

[12] Alfred E. Kahn, *Whom the Gods Would Destroy, or How Not to Deregulate*, AEI-Brookings Joint Center for Regulatory Studies, Washington, D.C., 2001, pp. 6-7.

evidence that the incumbent provider's actual costs were incurred imprudently, raises legitimate questions of "regulatory opportunism" and worse.[13]

11. Established economic principles recognize that entry is efficient and hence desirable from a social welfare perspective when the new entrant can produce the good or service at a cost lower than that of the incumbent provider (*Principle 1* and *Principle 2*). Entry under these conditions enhances social welfare precisely because fewer scarce resources are required to produce any given quantity of goods and services. This is the fundamental problem created by so-called "efficient costs"—it provides would-be entrants with precisely the wrong signals as to whether facilities-based entry is desirable from a social welfare perspective. To wit, a facilities-based provider with costs that are higher than the costs that would be incurred by a hypothetically efficient firm (even assuming that such costs could be determined accurately by regulators) will choose not to enter when in fact social welfare would be enhanced by such entry.[14] In this important respect, hypothetical TELRIC distorts the entrant's "build or buy" decision (*Principle 1*) and therefore works at cross purposes to efficiency principles, social welfare and Congressional intent. Contrary to the claims of the opposing parties, hypothetical TELRIC is inherently and unavoidably anticompetitive.

12. Before turning to the specific economic arguments raised by the opposing parties, it is important to highlight an issue fundamental to this proceeding. The Commission has stated that its TELRIC methodology is intended to determine the "cost today to build and operate an efficient network . . . that can provide the same services as the incumbent's existing network."[15] The CLEC economists present the Commission with a binary choice. If the incumbent providers' actual network characteristics (*e.g.*, structure sharing percentages) are used to develop TELRIC measures, this must of necessity imply a short-run costing standard in which "much of the incumbents' investment in their existing structure is sunk" for the purposes of pricing unbundled

[13] See, for example, Dennis L. Weisman, "Is There '*Hope*' for Price Cap Regulation," *Information Economics and Policy*, Vol. 14(3), September 2002, pp. 349-70.

[14] This problem is exacerbated when regulators exploit the "informational vacuum" surrounding hypothetical TELRIC in order to justify unrealistically-low prices for unbundled network elements and thereby promote entry by "resellers."

[15] NPRM at ¶ 30.

network elements.[16, 17] Conversely, if a long-run costing standard is adopted, it must of necessity assume that the network is built anew on a "scorched earth" in which all decisions are centrally-planned across distinct entities in the economy to maximize efficiency.[18] In framing the issue in this manner, the CLEC economists implicitly reject the very premise underlying the Commission's TELRIC methodology. To wit, neither a short-run approach nor a centrally-planned, "scorched-earth" approach would replicate the "cost today to build and operate an efficient network." Moreover, neither approach provides for adequate compensation to the incumbent providers.

II. The Purported "Validation" of Hypothetical TELRIC

13. The economists filing on behalf of AT&T make the claim that hypothetical TELRIC has been "validated" by the United States Supreme Court in *Verizon v. FCC* and by numerous state public service commissions.[19] As such, these economists recommend that the Commission stay the course and not affect any substantive changes to the theory underlying TELRIC or its implementation in setting prices for unbundled network elements. The claims by the AT&T economists are fallacious. In fact, although the Supreme Court in *Verizon v. FCC* found that it could not "say that the FCC acted unreasonably in picking TELRIC" as opposed to another methodology,[20] the Court did *not* validate the economic principles underlying TELRIC.[21] Nor should the fact that some state commissions have seen fit to use hypothetical TELRIC as an instrument of regulatory opportunism be construed to suggest that its underlying economic principles have been validated.

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[16] Willig Declaration at ¶ 97.

[17] Pelcovitz at 45-49. Efficient prices for unbundled network elements should essentially treat capital costs as sunk because there is excess capacity on the ILECs' networks.

[18] For example, in the long-run, the costs of structures would be shared equally by the telephone, natural gas and electric power companies.

[19] Mayo Affidavit at 1.1 ; Willig Declaration at ¶ 18.

[20] *Verizon v. FCC* at 508.

[21] The Court assessed the economics of TELRIC versus other methods proposed by the incumbent providers and rejected the incumbent providers' contention that "the FCC's choice of TELRIC…was unreasonable as a matter of law because other methods of determining cost would have done a better job of inducing competition." *Id.* at 507.

A. The United States Supreme Court

14. Justice Souter, writing for the majority in *Verizon v. FCC*, went to great lengths to point out that the Court was rendering a legal opinion and not an economic one, with a wide berth given to the FCC under the *Chevron Doctrine*.

> Whether the FCC picked the best way to set these rates is the stuff of debate for economists and regulators versed in the technology of telecommunications and microeconomic pricing theory. The job of judges is to ask whether the Commission made choices reasonably within the pale of statutory possibility in deciding what and how items must be leased and the way to set rates for leasing them. The FCC's pricing and additional combination rules survive that scrutiny.[22]

The key issue in *Verizon*, therefore, was whether the Commission had acted reasonably as a matter of law in selecting the TELRIC methodology. The primary purpose of this proceeding is entirely different. The primary purpose of this proceeding is to provide the Commission with the opportunity to reevaluate the validity of the economic principles underlying TELRIC, how TELRIC has been applied at the state level, and to make any changes that are deemed necessary to realize the goals of the Telecommunications Act. Hence, regardless of what one thinks about the limited conclusions reached by the Court, its ruling should not be and, in fact, cannot be mistaken for an economic validation of the economic principles underlying TELRIC, much less the actual results that arise from the application of those principles.

15. Justice Breyer has twice reviewed and twice concluded that the FCC's pricing rules for unbundled network elements work at cross-purposes to statutory intent. In addition to his expressed concerns with the Commission's rules failing to distinguish between a new form of regulation and a deregulatory act,[23] he has poignantly observed that:

> The competition that the Act seeks is a process, not an end result; and a regulatory system that imposes through administrative mandate a set of prices that tries to mimic those that competition would have set does not thereby become any less a regulatory process; nor any the more a competitive one.[24]

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[22] *Id.* at 539.

[23] *See* ¶ 6 *supra.*

[24] *Iowa Utilities Board v. FCC*, 525 U.S. 366, 424 (1999).

16. Opposing parties in other Commission proceedings regarding unbundled network elements have argued that Justice Breyer's opinions should be accorded no weight by the Commission because his views on TELRIC came in the form of dissents. I would have a somewhat different view. Namely, Justice Breyer, the one indubitable expert among the Court's membership in the economics of regulation, found the Commission's implementation of the Act and the use of TELRIC (or at least the open-ended nature of TELRIC and how it has been applied) to be at odds with both sound economic principles and Congressional intent. At the very least, a dissenting opinion from such a renowned regulatory expert should carry considerable weight in the Commission's reexamination of its rules. After all, this is not a proceeding to re-adjudicate the legality of TELRIC, but rather a proceeding to refine the methodology underlying TELRIC and ensure that it is applied in a manner consistent with sound economic principles.

17. Thus, what is at issue in this proceeding is the important distinction between TELRIC as a theoretical costing methodology and the application of TELRIC models in state proceedings to establish prices for unbundled network elements, including the inputs used to populate these models and the support for those inputs. A key part of this inquiry concerns whether the TELRIC methodology as applied in the states crosses the line between *predictive judgment* and *wild speculation*. The Supreme Court did not speak to specific inputs, although it dealt at some length with the adequacy of TELRIC, at least in theory, to provide sufficient depreciation and allowance for capital costs. In addition, it is important to distinguish between what was represented to the Supreme Court by the Commission and what has actually occurred. First, the Supreme Court was not informed that costs would be based solely on speculation, without any regard to the costs and operating practices of an actual facilities-based competitor. Second, the new entrants represented to the Supreme Court that costs would be based on technologies deployed in the incumbent providers' networks, but that has not occurred (*e.g.*, automated processes for CLEC orders, automated distribution frames that eliminate cross connects). Third, the Commission and new entrants (CLECs) represented that the cost of capital and

depreciation would be set so as to reflect a fully competitive market and the associated regulatory risks, when in fact that has not occurred either.

18. With respect to this first point, concerning the speculative nature of TELRIC, Justice Souter, writing for the majority, appears to explicitly reject a purely speculative costing standard:

> But even if a competitor could call for a new TELRIC rate proceeding immediately upon the introduction of a more efficient element by a competing entrant, the competitor would not necessarily know enough to make the call; the fact of the element's greater efficiency would only become apparent when reflected in lower retail prices drawing demand away from existing competitors (including the incumbent), forcing them to look to lowering their own marginal costs. In practice, it would take some time for the innovating entrant to install the new equipment, to engage in marketing offering a lower retail price to attract business, and to steal away enough customer subscriptions (given the limited opportunity to capture untapped customers for local telephone service) for competitors to register the drop in demand.[25]

19. Hence, there would appear to be a "market observability" criterion that must be satisfied with respect to both the availability of the element *and* the savings it would generate. In my prior declaration at ¶ 21, I stressed the importance of making the distinction between "most efficient technology deployed" and "most efficient technology available on the market." I argued further that "any technology can be placed on the market (or alleged to be 'theoretically feasible'), but a technology that has actually been deployed on a scope and scale comparable to that experienced by an ILEC presumably passes some further test of validity."

B. Determinations by State Public Service Commissions

20. The *opposition* economists contend that hypothetical TELRIC is somehow valid because it has been reviewed, adopted and applied by a number of state public service commissions. Not all state public utility commissions have explicitly

[25] *Verizon v. FCC* at 506.

endorsed TELRIC, however.[26] More importantly, I submit that state commission approval is not a credible litmus test for establishing the validity of hypothetical TELRIC. I say this due to an incentive problem that I refer to as "regulatory moral hazard."[27] The problem of regulatory moral hazard arises when regulators in price-cap jurisdictions adopt excessively aggressive competitive entry policies because the incumbent firm has little or no recourse to the commission in the event of an earnings deficiency. In other words, the state regulator is essentially "fully insured" against any adverse effects of promoting competition in local telephone service markets (*e.g.*, subsidy erosion and the resulting upward pressure on non-compensatory rate structures).[28]

21. There is, in fact, some empirical evidence to suggest that the prices for unbundled network elements are endogenously influenced by the type of retail regulation under which the incumbent provider operates. One such study found that unbundled local loop rates are significantly lower (in excess of $3.00 per month) in price cap states than in states that operate under some form of earnings regulation.[29]

> Pure price cap regulation is a superior regulatory regime in that it provides the incumbent firm with ideal (high-powered) incentives for cost-minimization. This suggests that, under pure price cap regulation, we should expect the firm's actual costs to be a closer approximation to the "efficient level.[30]

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[26] *See*, *e.g.*, Commission Order, Docket No. 99A-577T, Decision No. C01-1302, adopted Nov. 13, 2001, at 11, wherein the Colorado PUC found that disputes regarding the "wisdom of the [TELRIC] methodology" are "immaterial to our deliberations here. Our duty is to follow the FCC's TELRIC mandate."

[27] Dennis L. Weisman, "Regulatory Moral Hazard: Price Caps and Endogenous Entry Under the 1996 Telecommunications Act," in *Expanding Competition in Regulated Industries*, ed. by Michael A. Crew, Boston, MA: Kluwer Academic Publishers, 2000, pp. 1-21; and Dennis L. Weisman, "Why Less May Be More Under Price-Cap Regulation," *Journal of Regulatory Economics*, Vol. 6(4), December 1994, pp. 339-62.

[28] For example, the state public service commissions were early and vigorous opponents of introducing competition into long distance markets. The concern was that competition in long distance markets would erode the toll-to-local subsidies that had historically been used to maintain rates for basic local telephone service at artificially-low levels. See Gerald W. Brock, *Telecommunication Policy for the Information Age*, Cambridge, MA: Harvard University Press, 1994, Chapters 8 and 9; and Dale E. Lehman and Dennis L. Weisman, *The Telecommunications Act of 1996*: *The "Costs" of Managed Competition*, Boston: Kluwer, 2000, Chapter 7. Presumably, in the absence of this upward pressure on basic local telephone service rates, state public service commissions would have welcomed the onset of long distance competition and its attendant benefits, including lower prices and expanded choices for consumers.

[29] Dale E. Lehman and Dennis L. Weisman, *The Telecommunications Act of 1996*: *The "Costs" of Managed Competition*, Boston: Kluwer, 2000, Chapter 7.

[30] Dale E. Lehman and Dennis L. Weisman, "The Political Economy of Price Cap Regulation," *Review of Industrial Organization*, 16, 2000, p. 349.

The fact that state decisions have been the opposite of what might have been expected suggests that the open-ended nature of hypothetical TELRIC creates opportunities for strategic behavior ("regulatory moral hazard") on the part of state regulators that works at cross-purposes with the goals of the Act.[31]

22. In fact, some state public service commissions have been rather open about the opportunities that price cap regulation affords to lower wholesale prices with "impunity." For example, in an open meeting of the Texas Public Utilities Commission ("TPUC"),[32] the record indicates that the Commissioners noted that Southwestern Bell had "freely elected into" price cap regulation and would therefore have no recourse to the Commission should a reduction in wholesale rates, purportedly to move them closer to "cost-based" levels, create an earnings deficiency.[33] The implications, of course, are that (1) because price cap regulation is in place, the state commissions can move unilaterally to reduce wholesale rates without suffering any adverse consequences, such as upward pressure on below-cost local service rates, and (2) state commissions can circumvent limitations on their authority to require reductions in retail rates by prescribing reduced wholesale rates in the hope that at least some of the reductions will be shared with consumers.[34]

23. Raymond Gifford, a past chairman of the Colorado Public Utilities Commission has written about the incentives for state regulators to manipulate TELRIC in order to create the appearance of competition.

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[31] For a related discussion of this problem, see Debra Aron and William Rogerson, "The Economics of UNE Pricing," Section 3.2, Filed as Exhibit A to SBC's Comments in this docket, December 16, 2003.

[32] Texas Public Utilities Commission, Open Meeting, Agenda Item No. 1, Docket Nos. 16189, 16196. 16226, 16285, 16290, 16455 17065, June 18, 1997, pp. 208-19.

[33] In *Verizon v. FCC*, the Supreme Court did not find that there was an opportunistic switch in regulatory regimes of the type that would raise constitutional questions. That narrow legal determination, however, cannot belie the facts on the ground. The facts are that hypothetical TELRIC enables state commissions to renege on their price cap agreements with the incumbent providers, apparently with impunity. Whether this constitutes a "switch" in regulatory regimes or simply "regulatory opportunism" is a distinction without a difference, at least insofar as the pertinent economic issues are concerned. *See* Dennis L. Weisman, "Did the High Court Reach an Economic Low in *Verizon v. FCC*?" *The Review of Network Economics*, Vol. 1(2), September 2002, pp. 90-105.

[34] Dale E. Lehman and Dennis L. Weisman, *The Telecommunications Act of 1996*: *The "Costs" of Managed Competition*, Boston: Kluwer, 2000, Chapter 7.

> The TELRIC standard, thus practiced, becomes not a careful, principled analysis of forward-looking rates (that cannot be done because the assumptions are the whole game), but rather a vehicle for creating a margin between wholesale and retail rates. The theory is that, if regulators create enough margin between wholesale and retail, then "competitive" entry will occur in the local exchange market.[35]
>
> While this incentive to create a margin may not be "real competition", the behavior comports with the regulators' incentives and abilities. A short time horizon, political pressure to show gains in competitive entry, and a plastic rate methodology – all this gives the regulator ample room to furnish the aesthetics of competition. Thus, the TELRIC rate-making becomes the vehicle to accomplish vague industrial policy and politically-attractive goals.[36]

In light of the incentives for strategic behavior on the part of state regulators, I do not believe that it is possible to draw any meaningful inference as to the validity of hypothetical TELRIC from the fact that it has been reviewed and adopted by some state public service commissions.[37]

III. "Efficient" Facilities-Based Competition

24. The Preamble of the Telecommunications Act, which is reproduced above, emphasizes three major themes: (1) The promotion of competition; (2) Reduced regulation and (3) The importance of an advanced telecommunications infrastructure. The presence of facilities-based alternatives to the incumbent providers' networks will allow the discipline of competitive market forces to substitute for the discipline of regulation.

25. In my Declaration at ¶ 6, I observed that "The principal objectives of the Telecommunications Act are best achieved by pricing rules that promote the development

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[35] Raymond L. Gifford. "Regulatory Impressionism: What Regulators Can and Cannot Do," *The Review of Network Economics*, Vol. 2(4), December 2003, p. 474.

[36] *Id.* at 475.

[37] Moreover, it is disingenuous for the opposition economists to claim on the one hand that we should consider hypothetical TELRIC valid because some state commissions have adopted it—recognizing their incentives to set inordinately-low prices for unbundled network elements—while on the other hand disavowing claims that the incumbent provider's actual, forward-looking costs should be considered "presumptively efficient" because their incentives to minimize costs may not be ideal. One cannot have it both ways—if the incumbent provider's incentives cannot establish the efficiency of their actual, forward-looking costs, the regulators' incentives cannot establish the validity of hypothetical TELRIC.

of efficient facilities-based competition." I observed further at ¶ 56 "that rivals should have the correct incentives to invest in facilities-based networks when and where it is efficient for them to do so." Addressing the issue of investment in facilities-based networks, the Commission, in turn, observes that

> To the extent that the application of our TELRIC pricing rules distorts our intended pricing signals by understating forward-looking costs, it can thwart one of the central purposes of the Act: the promotion of facilities-based competition.[38]

26. Dr. Pelcovits contends that "it is absurd to set artificially high UNE prices to provide an artificial incentive for CLECs to build network components when there is excess capacity and the network is undergoing substantial technological change."[39] Professor Willig contends that "The proper goal of UNE pricing is not to encourage facilities-based investment regardless of cost, but to encourage facilities-based investment only when it is the most efficient alternative."[40] They argue that, in fact, the Commission's policies should be concerned only with promoting efficient facilities-based entry in the market for local exchange telephone service. That argument raises an important issue worthy of some discussion, namely, how to distinguish between "efficient" and "inefficient" facilities-based entry. Entry is efficient, of course, when the entrant can produce telecommunications services at a cost lower than that of the incumbent provider.[41]

27. Furthermore, promoting efficient marketplace outcomes may well be consistent with some degree of "over-investment" in facilities-based networks.[42] In the absence of facilities-based alternatives to the incumbent provider's network, there can be no "reduced regulation" and certainly no sunset for regulation. This means that society will continue to incur the social costs of regulation, which include complex and time-

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[38] NPRM at ¶ 3.

[39] Pelcovits Declaration at 10-11.

[40] Willig Declaration at 10 and 37.

[41] *See supra* at ¶ 11; *infra* at ¶ 52.

[42] By use of the term "over-investment" in facilities based networks, I mean that amount of facilities-based entry in excess of that which would be observed if network element prices were set equal to the actual, forward-looking costs of the incumbent provider.

consuming regulatory proceedings, protracted litigation and "rent-seeking" behavior.[43, 44] Consider now the possibility that $X of "over-investment" in facilities-based networks enables society to avoid $Y of costs of regulation, where X < Y. This is a "second-best" type argument that recognizes that economic efficiency may be consistent with some degree of "over-investment" in facilities-based networks.[45]

28. It follows from the above discussion that it is not patently unreasonable as a matter of public policy or economics to "err" on the side of somewhat more rather than somewhat less facilities-based entry. This necessarily implies that would-be entrants should have the requisite incentives to invest in facilities-based networks and unbundled network elements should not be priced at artificially-low levels.

IV. Investment Incentives

29. Investment in a modern telecommunications infrastructure, inclusive of investment in facilities-based networks, is a key objective of the Telecommunications Act. There has been considerable discussion in this proceeding as to the effect that the pricing of unbundled network elements will have on the incentives to invest by both incumbent providers and would-be market entrants. The purpose of this discussion is two-fold, first, to review the pertinent regulatory and legal history on this issue; and second, to evaluate some of the theoretical arguments that have been advanced by the opposition economists in support of the claim that lower network element prices will

[43] Rent-seeking in this context refers generally to socially unproductive expenditures on securing market outcomes that are privately beneficial but socially detrimental. These social costs can take numerous forms that include: (1) A diversion of resources from the marketplace to the hearing room; (2) Compliance costs; (3) Strategic use of the regulatory process by competitive entrants that may serve to delay the introduction of new services, establish artificially high price floors for the incumbent, and even raise the incumbent's costs of providing service; and (4) Competitors developing a dependence on the regulatory process for their very survival. *See*, *for example*, Fred S. McChesney, *Money for Nothing: Politicians, Rent Extraction, and Political Extortion*, Cambridge, MA: Harvard University Press, 1997. *See also* Richard A. Posner, "The Social Costs of Monopoly and Regulation," *Journal of Political Economy*, Vol. 83(4), 1975, pp. 807-27.

[44] There is a long history of this type of strategic behavior in regulated industries. For a discussion of these issues in the telecommunications industry, *see* Alfred E. Kahn. "The Uneasy Marriage of Regulation and Competition," *Telematics*, Vol. 1, No. 5, September 1984, pp. 1-17; and Dennis L. Weisman, "Asymmetrical Regulation," *Telecommunications Policy*, Vol. 18(7), October 1994, pp. 499-505.

[45] The argument is presumably strengthened by the fact that competition from facilities-based entrants fosters more innovation than competition from UNE-based entrants or mere resellers.

[actually] encourage investment on the part of incumbent providers. Professor Lehman addresses the related empirical questions in a separate declaration.

A. The Regulatory and Legal History

30. In the *UNE Remand Order*, the Commission clearly took the view that unbundling would accelerate facilities-based investment on the part of the new entrants. This conclusion was based, in part, on assurances by the CLECs that they would build their own networks once they established a "foot-hold" in the market with the use of UNE-P.

> We agree with the competitive LECs that argue that unbundled access to certain incumbents' network elements will accelerate initially competitors' development of alternative networks because it will allow them to acquire sufficient customers and the necessary market information to justify the construction of new facilities. Indeed, many commenters in this proceeding emphasize that they plan to deploy alternative facilities as soon as it is technically and economically possible to do so at a cost that is close to the incumbent LECs' prices for network elements (footnotes omitted).[46]

31. There is no evidence of which I am aware that these or other carriers have transferred customers from UNE-P to their own facilities, or combinations of their own alternatives to UNEs (*e.g.*, loops and switches) with UNEs leased from ILECs. To the contrary, the recent upturn in UNE-P volumes has been accompanied by a virtual cessation in the growth of other forms of new-entrant deployment. To wit, the Commission's most recent local competition report shows that while UNE-P volume increased by more than 27 percent nationwide between December 2002 and June 2003,[47] UNE-L (including resale) volumes actually declined. This suggests that new entrants are not only reducing their use of self-deployed switching but migrating customers from UNE-L to UNE-P. In similar fashion, while the volume of UNE-P has more than quadrupled since the end of 2000, the number of self-provisioned loops (excluding those owned by "intermodal" cable television providers) actually declined by over 20 percent. Moreover, during 2000-2001, when UNE prices were lowered even further in the second

[46] *UNE Remand Order* at ¶ 112.

[47] "Local Competition Status as of June 30, 2000," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission, December 2003.

round of state commission proceedings following adoption of the Act, AT&T announced and completed the sale for more than $50 billion less than it paid to Comcast for the cable assets that AT&T had purchased from TCI and MediaOne for the express purpose of being able to provide facilities-based local telephone service. In other words, the increased use of UNE-P has coincided with *declining* investments in self-provisioned switching and loop facilities.

32. It is instructive to take special note of one particular sentence in the above-cited passage from the *UNE Remand* Order that CLECs "plan to deploy alternative facilities as soon as it is technically and economically possible to do so at a cost that is close to the incumbent LECs' prices for network elements."[48] The CLECs did not argue in the *UNE Remand proceeding*, as they do in this proceeding, that competitive supply for unbundled network elements is competitively infeasible. Indeed, they indicate that they expect to deploy their own networks "at a cost that is close to the incumbent LECs' prices for network elements." What this confirms is that artificially-low prices for unbundled network elements, based on the use of hypothetical TELRIC, discourages investment in alternative networks in favor of leasing facilities from the incumbent provider. This outcome runs counter to the principal objectives of the Telecommunications Act, including increased innovation, new technology deployment and "reduced regulation." Congress clearly intended for there to be increased reliance on market forces in the telecommunications industry and this means facilities-based competition, not resale competition.

33. More specifically, the Commission further notes in its *UNE Remand Order* at ¶ 110 "that consumers benefit when carriers invest in their own facilities because such carriers can exercise greater control over their networks, thereby promoting the availability of new products that differentiate their services in terms of price and quality." The fact that artificially-low prices for unbundled network elements discourage construction of alternative networks necessarily translates into a deleterious effect on innovation. And yet, encouraging innovation through the deployment of advanced

[48] *UNE Remand Order* at ¶ 112.

telecommunications technologies is one of the principal goals of the Telecommunications Act.

34. The Commission seems to recognize the inherent limitations of "resale" competition in the TRO when it observes that:

> Although we recognize that Congress intended to create a competitive landscape through resale, interconnection and facilities-based provision, and a combination of these modes of entry, in practice, we have come to recognize more clearly the difficulties and limitations inherent in competition based on the shared use of infrastructure through network unbundling. While unbundling can serve to bring competition to markets faster than it might otherwise develop, *we are very aware that excessive network unbundling requirements tend to undermine the incentives of both incumbent LECs and new entrants to invest in new facilities and deploy new technology* (emphasis added).[49]

This passage speaks not only to the disincentives for investment created by unbundling requirements, but also to the relationship between the incentives to invest and the prices for unbundled network element. To wit, there must exist a sufficiently high price for unbundled network elements that would tend to encourage rather than discourage investment. Hence, it is not the unbundling requirement *per se* that discourages investment, but the unbundling requirement in combination with artificially-low prices for network elements. Thus, the intimation on the part of the Commission is that lower prices for unbundled network elements tend to discourage investment, *ceteris paribus*.

35. The Commission has recognized the importance of "striking an appropriate balance between increasing infrastructure investment and innovation, and fostering sustainable competition from both intermodal and intramodal service providers" in setting the prices for unbundled network elements.[50] This serves to underscore an observation that I made in my Declaration that the Telecommunications Act has multiple objectives and hence so must the prices set for unbundled network elements.[51] Moreover, as Justice Breyer observes:

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[49] TRO at ¶ 3.

[50] *Id*. at ¶ 6.

[51] Weisman Declaration at ¶ 8.

> The upshot, in my view, is that the statute's unbundling requirements, read in light of the Act's basic purposes, require balance. Regulatory rules that go too far, expanding the definition of what must be shared beyond that which is essential to that which merely proves advantageous to a single competitor, risk costs that, in terms of the Act's objectives, may make the game not worth the candle.[52]

This theme was noted with approval by the D.C. Circuit Court of Appeals in its *USTA Decision*, where the court held:

> Each unbundling of an element imposes costs of its own, spreading the disincentive to invest in innovation…. At the same time – the plus that the Commission focuses on single-mindedly – a broad mandate can facilitate competition by eliminating the need for separate construction of facilities where such construction would be wasteful. Justice Breyer concluded that fulfillment of the Act's purposes therefore called for 'balance' between these competing concerns (citations omitted).[53]

B. Rejoinder to the CLEC Economists

36. Professor Robert Willig provides an empirical analysis of the investment behavior of the incumbent providers and how the incentives for investment vary with the prices of unbundled network elements.[54] At a theoretical level, Professor Willig presents two competing hypotheses—the *investment deterrence hypothesis* and the *competitive stimulus hypothesis*.[55] The *investment deterrence hypothesis* argues that lower unbundled network element prices discourage investment by the incumbent providers. The *competitive stimulus hypothesis* suggests just the opposite—that lower unbundled network element prices encourage market entry and this entry, in turn, stimulates investment by the incumbent providers.

37. The principal conclusion of Professor Willig's analysis purportedly demonstrates that the *competitive stimulus hypothesis* dominates—lower prices for unbundled network elements [actually] encourage incumbent providers to increase

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[52] *Iowa Utilities Board* at 429-30.

[53] *USTA v. FCC,* 290 F.3d 415, 427 (2002).

[54] Robert D. Willig, "Investment Is Appropriately Stimulated By TELRIC," Attachment to AT&T Filing in this Docket, December 16, 2003. Hereafter, Willig-Investment Incentives.

[55] *Id.* at 3.2.

investment.[56] Professor Lehman's attempted replication and analysis of Professor Willig's empirical investigation reveals that this conclusion does not hold up to scrutiny. Professor Lehman shows that when Professor Willig's dependent variable, *investment per-capita*, is replaced with *investment* alone, the inverse relationship that Professor Willig reports between unbundled network element prices and investment disappears and, in some cases, is actually reversed.[57] In other words, modest changes in Professor Willig's models produce dramatically different and, in some cases, contradictory results. It follows that Professor Willig's empirical investigation of investment behavior is not sufficiently reliable to credibly inform the Commission's deliberations on pricing policies and its implication for investment in the telecommunications industry.

38. It is nonetheless useful to examine Professor Willig's competing hypotheses more carefully in order to understand the full implications of his arguments. Let us begin with the *investment deterrence hypothesis*. The basic idea here, of course, is that by reducing the unbundled network element price, one lowers the incumbent provider's expected return on investment, which tends to discourage investment, *ceteris paribus*. The *competitive stimulus hypothesis* argues that the lower unbundled network element price encourages more market entry, which will, in turn, encourage the incumbent provider to invest in order to stake out its position in the marketplace (and also possibly to signal entrants of its intentions of vigorously defending its territory).

39. Hence, if Professor Willig's analysis is correct, it suggests that the more that the incumbent provider is forced to subsidize its rivals through artificially-low network element prices, the stronger the incentives on the part of incumbent providers to invest in telecommunications infrastructure. This conclusion fails the reasonableness test as well as the economic test. Where Professor Willig errs is in failing to distinguish between facilities-based entrants and "clone" resellers. The *competitive stimulus*

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[56] *Id.*

[57] The Telecommunications Act makes explicit reference to the term "investment" no less than eight times, but nowhere makes reference to the phrase "investment per-capita," and with good reason. The Congress was specifically interested in encouraging investment in a modern telecommunications infrastructure. Investment per-capita may be increasing, while overall investment is decreasing. This could occur because investment is decreasing more slowly than the population. Suppose, for example, that in 2001 and 2002, investment is 100 and 90, while population is 50 and 40, respectively. Over this time period, investment per-capita increases by 12.5 percent while investment decreases by 10 percent.

hypothesis is plausible, within reasonable bounds, only insofar as it concerns the incumbent provider investing defensively to protect (or grow) its market share against *facilities-based providers*. The additional investment can be used by the incumbent provider to differentiate its product through quality enhancements and thereby secure a source of competitive advantage.

40. The *competitive stimulus hypothesis* is entirely implausible, however, insofar as it concerns the incentives for the incumbent provider to invest in order to compete more effectively against a "clone" reseller. This is so because the incumbent provider's investment in product enhancement simultaneously enhances the product against which it competes—that of the "clone" reseller. A lower price for the network element reduces the marginal cost for the "clone" reseller and hence its profit-maximizing price in equilibrium. Since prices are strategic complements, a lower price for the "clone" reseller will induce the incumbent provider to lower its product price. And yet a lower product price implies a lower expected return on any given quantity of investment, *ceteris paribus*. Finally, it should be noted that the *competitive stimulus hypothesis* might well be plausible, within reasonable bounds, if new entrants were transitioning to their own facilities,[58] but there is no evidence of this. In fact, the evidence according to the Commission's own *Local Competition Report* is seemingly to the contrary.[59]

41. Professor Willig's findings are further refuted by a recent academic article that examined the effect of the Commission's TRO to continue UNE-P on the stock prices of equipment manufacturers. If Professor Willig is correct in his claims, one would expect this decision to have a positive impact on the share prices of the equipment manufacturers. In fact, precisely the opposite occurred.

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[58] Even in this case, however, the conclusion must be qualified accordingly. The incumbent providers might well believe that artificially-low unbundled network element prices would be used only to "jump start" competition and would not be a permanent fixture in the telecommunications market. At some point, however, the incumbent providers would come to believe that these artificially-low prices would continue indefinitely and so would the subsidization of their rivals. The effect would be to discourage investment. Hence, at the very least, the artificially-low unbundled network element prices would have to be terminated in order to provide the incumbent provider with the requisite incentives to invest in telecommunications infrastructure.

[59] *See supra* at ¶ 31.

> Second, both leading suppliers of narrowband (voice) infrastructure, Nortel and Lucent, exhibit a pattern of returns similar to the ILECs. This suggests that enhanced UNE-P rules are not only a negative for incumbent carriers but also for equipment manufacturers supplying switches and other network infrastructure. This evidence is consistent either with the theory that generous UNE-P opportunities lead incumbent and competitive carriers to substitute out of network infrastructure, or the rent-seeking explanation of resale competition developed above, or both. It is inconsistent, however, with the view that UNE-P helps facilitate competitive entry that will result in increased network investment.[60]

42. The opposition economists essentially make two theoretical claims about the effect of the Commission's TRO on the incentives for the incumbent providers to invest. First, they argue that because new entrants are no longer entitled as a result of the TRO to access new broadband facilities (*e.g.*, copper/fiber hybrid loops, fiber to the home, packet switching, etc.), low prices for legacy facilities, which the new entrants are entitled to access, can have no impact on the incumbent provider's incentive to invest, and that the goal of the Commission's pricing rules should therefore be to lower resale prices even further.[61] The implication being that "prices no longer need to create the right incentives for the ILECs or the CLECs to invest in the network." Second, they argue that the Commission concluded in the TRO that it is not feasible to duplicate elements that remain subject to unbundling. It is therefore nonsensical, according to their arguments, to conclude that higher rates will provide the requisite incentives for self-deployment.[62]

43. The first opposition argument concerning the TRO, the premise that the incumbent providers are investing only in the so-called "greenfield" technologies to the complete exclusion of the "legacy technologies," does not comport with the facts on the ground (*Principle 3*).[63] The opposition economists intimate that legacy technologies are somehow synonymous with sunk costs. The fact of the matter is that the incumbent

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[60] "Thomas W. Hazlett and Arthur M. Havenner, "The Arbitrage Mirage: Regulated Access Prices with Free Entry in Local Telecommunications Markets. " *The Review of Network Economics*, Vol. 2(4) December 2003, p. 447.

[61] *See* MCI at 14; Z-TEL at 3.

[62] *See* AT&T at 34; MCI at 12.

[63] *See* Qwest Reply Comments at 25.

providers are continuing to invest in these legacy technologies. Furthermore, the investment decisions of the incumbent providers are based in large part on the expected returns from these investments relative to other investment opportunities available to them. Hence, lower prices for unbundled network elements necessarily imply a lower expected return from investment and hence diminished incentives for investment, *ceteris paribus*. The second opposition argument concerning the TRO and the infeasibility of competitive supply for certain network elements is a fundamentally incorrect reading of that order. The TRO does not call for a finding of impairment and hence unbundling where competition is necessarily infeasible, but merely where competition has not yet materialized to a degree that would conclusively demonstrate otherwise. In fact, the Commission draws no conclusions whatsoever in its TRO concerning the infeasibility of competitive supply for any network element.

44. The positions of Professor Willig and Dr. Pelcovits concerning the infeasibility of competition for network elements is in direct conflict with the TRO. The TRO sets out guidelines for determining whether a particular network function should be unbundled and offered to CLECs at a price based on TELRIC. The TRO stipulates that when a minimum number of CLECs in a given market deploy their own facilities, the market "trigger" is satisfied, there is "no impairment" and hence no obligation for the incumbent provider to supply the unbundled network element at a price based on TELRIC. This Commission recognized in its *UNE Remand Order* that CLECs "plan to deploy alternative facilities as soon as it is technically and economically possible to do so at a cost that is close to the incumbent LECs' prices for network elements."[64] This highlights two serious concerns. First, unrealistically-low prices for network elements tend to discourage CLECs from investing in their own facilities. Second, because satisfying the market "trigger" requires actual deployment of CLEC facilities, artificially-low prices for unbundled network elements introduce a bias in favor of finding impairment when, in fact, there is none.[65] In essence, the CLEC claim of competitive infeasibility becomes a "self-fulfilling" prophecy. The reality is not that competition for

[64] *UNE Remand Order* at ¶ 112 (citations omitted) (15 FCC Rcd. 3696, 3749 (1999).

these network elements is infeasible, merely that it is not cost-effective when prices for unbundled network elements are set at artificially-low levels based on hypothetical TELRIC.

45. The arguments advanced by the opposition economists (Pelcovits and Willig) appear to suggest that basic telephony by incumbent local telephone companies should be considered a byproduct of investment in their telephone networks. As such, the argument is purportedly that unbundled network element prices should reflect only the incremental cost associated with providing basic telephony given that the incumbent provider has already invested in a network capable of supplying more advanced services, such as packet switching and broadband.

46. This notion that basic telephony is incremental to the provision of more advanced telecommunications services raises a number of provocative issues. First, what is the economic rationale for suggesting that basic telephony is the byproduct of investment in advanced telecommunications services when basic telephony is the primary business of the incumbent providers? It may be reasonable to treat telephony as the byproduct of investment in cable television networks because cable television is the primary business of the cable television providers, but basic telephony is certainly not a byproduct of the investments of the incumbent providers.

47. Second, if basic telephony and advanced telecommunications services are truly joint products[66]—in the sense that they have no separately identifiable marginal costs[67]—state regulators will once again be drawn into the "dark abyss" of cost allocations. There are, of course, no scientific principles for allocating costs and this is particularly problematic in the presence of "regulatory moral hazard" and the short-term incentives of state regulators.[68] For example, it may be attractive for state regulators to allocate costs on the basis of bandwidth because it would enable them to justify giving new entrants a "free-ride" on the investments of the incumbent providers. It is this very

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[65] Satisfying the "trigger" is a sufficient, but not a necessary condition for demonstrating the absence of impairment. There are other ways to demonstrate an absence of impairment provided for in the TRO (*e.g.*, potential deployment) but these are "uphill climbs" by design. *See* TRO at ¶ 506.

[66] *See* AT&T at 53-55.

[67] Alfred E. Kahn, *The Economics of Regulation*, New York: Wiley, 1971, p. 79.

sort of "regulatory opportunism"—masquerading as science—that left unchecked will undermine the goals of the Telecommunication Act.

48. Third, in implementing a deregulatory statute, the Commission should take great care not to predetermine marketplace outcomes. The fact of the matter is that the Commission does not know and, in fact, cannot know how telecommunications markets will evolve, what technologies will come to dominate, or even what services will be in demand, and it should therefore avoid any overt policy determinations that influence market structure. In other words, it should adhere to the prime directive of *non-interference*.

49. The bottom line is that regardless of how telecommunications markets evolve, artificially-low prices for unbundled network elements can be expected to lower the incumbent providers' expected returns and thereby weaken incentives for investment in telecommunications infrastructure, *ceteris paribus*. If an ILEC were forced to give away telephony services—the main sources of its revenues in all markets—it would never be able to justify investments in any network, let alone a broadband network. In other words, we are back to where we began—in a "bad equilibrium" in which the incumbent providers do not invest because they cannot recover their costs and the new entrants do not invest because it is cheaper to lease. It is therefore critical that the Commission's pricing policies for unbundled network elements not distort the entrants' "build or buy" decision (*Principle 1*).

V. Pricing of UNEs

50. It is not possible, of course, to separate the issue of providing the requisite incentives for investment in telecommunications infrastructure from the issue of the efficient pricing of unbundled network elements. In my Declaration, I stated that "The default costing standard for the proper measurement of TELRIC is a long-run, forward-looking cost standard that reflects the actual network characteristics of the ("presumptively efficient") incumbent provider."[69] (*Principle 2*).

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[68] *See* the discussion in Section II.B., *supra*.

[69] *See* Weisman Declaration at ¶ 20.

51. I will not repeat here all of the economic arguments that I previously advanced in support of this costing standard,[70] but it is instructive to examine the critical elements. These critical elements are: (1) The use of actual network characteristics; (2) The use of a long-run, forward-looking perspective; and (3) The "presumption of efficiency" with respect to the incumbent provider's actual, forward-looking costs. I review each of these, in turn, before addressing the shortcomings of some of the other approaches that have been put forward by the opposition economists.

A. The Economic Rationale for Actual, Long-Run Forward-Looking Costs

52. The Commission's pricing rules for unbundled network elements should attempt to promote entry that is efficient and hence desirable from a social welfare perspective. Abstracting from any "second-best considerations, entry should take place when the new entrant can produce the good or service at a cost lower than that of the actual forward-looking costs of the incumbent provider (*Principle 1* and *Principle 2*). Entry under these conditions enhances social welfare precisely because fewer scarce resources are required to produce any given quantity of goods and services.

53. This discussion serves to underscore the problem created by the use of so-called "efficient costs" in the pricing of unbundled network elements—it provides would-be entrants with precisely the wrong signal as to whether facilities-based entry is desirable from a social welfare perspective. To wit, a facilities-based provider with costs that are higher than hypothetical TELRIC, but lower than the incumbent provider's actual, forward-looking costs, will choose not to enter when in fact social welfare would be enhanced by such entry. It is in this manner that hypothetical TELRIC distorts the entrant's "build or buy" decision (*Principle 1*).

> In unregulated markets, prices tend to be set on the basis of the actual costs of the incumbent firms, and they should be. The economic purpose of prices set at incremental cost is to inform buyers – and make them pay – the cost that society will *actually* incur if they purchase more or would *actually* save if they reduced their purchases, entirely or partially. These can only be the costs of the supplier whose prices are being set, not some hypothetical ideal producer. Moreover, such prices give challengers the proper target at which to shoot – the

[70] *See id*. at ¶¶ 20-28.

> proper standard to meet or beat and the proper reward if they succeed. If they can achieve costs lower than that, they will enter and *in the process* (which the FCC's pricing rules would omnisciently short-circuit) beat prices down to efficient levels. In contrast, TELRIC-based charges – if the FCC's apparent expectation that such rates would be lower than rates based on the telephone companies' actual costs is correct – would actually discourage competitors from coming and building their own facilities, which it was the clear intention of the new Act to encourage (footnotes omitted).[71]

54. In my Declaration at ¶ 26, I argued that "The Telecommunications Act at its core is a governmental obligation imposed on the incumbent providers to supply network elements to rivals." As such, the government serves as a *de facto* agent for the rivals of the incumbent provider under the Telecommunications Act, much as it previously served as an agent for end-user customers under the traditional *regulatory contract*. In the absence of such a regulatory contract, the incumbent providers would naturally enter into long-term contracts with new entrants to minimize demand uncertainty and increase the likelihood of cost recovery. The fact that such long-term contracts are quite common in markets characterized by a high degree of asset specificity and non-fungible plant adds additional weight to this argument. The implication then is that the long-run, forward-looking cost measure is the efficient costing standard for the pricing of network elements.

55. Imagine if you will a world in which there is no uncertainty and unbundled network elements can be produced instantaneously in infinitesimal quantities to satisfy existing demand. In this world, the distinction between short-run and long-run cost measures largely disappears. The price of network elements would reflect precisely the instantaneous production costs that are incurred in supplying them. In the real world, the relevance of the distinction between short-run and long-run costs arises because (1) demand is uncertain; (2) investment must be made in discrete units, meaning that it is

[71] Alfred E. Kahn, Timothy J. Tardiff and Dennis L. Weisman, "The 1996 Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the FCC," *Information Economics and Policy*, Vol. 11(4), December 1999, p. 330.

"lumpy"; and (3) it is typically necessary to invest "ahead of demand," due, in part, to carrier-of-last resort obligations.[72]

56. In the absence of a long-term contract for the sale of the services in question, there will typically be a mismatch between prevailing demand and available supply. The incumbent provider would typically rectify this situation by pricing on the basis of some short-run marginal cost measure since the capital costs are sunk at the time of sale. The obvious question that presents itself concerns whether new entrants that purchase network elements on-demand (as opposed to long-term contract) should be afforded the same pricing flexibility as the incumbent provider. This question can be answered in the negative.

> In contrast, there is no difference in principle between the incumbent provider incurring the sunk costs of serving an anticipated level of demand and a non-facilities-based competitor committing in advance to lease from it the requisite network elements under long-term contract. In both cases, the relevant measure of incremental cost at the time of the retail sale could be below, perhaps significantly below, LRIC: the capacity costs are sunk. In these circumstances, the respective risks are symmetrical and the permissible ranges of retail pricing flexibility for the several competitors ought to be comparable.[73]

57. The above passage suggests that symmetry of risk-bearing implies symmetry of pricing flexibility. It is bad public policy and even worse economics for regulators to require the incumbent provider to invest "ahead of demand" absent a long-term contract, and then turn around and force the incumbent provider to sell unbundled network elements to rivals at prices based on short-run costs on grounds that the capital costs are sunk at the time of sale. Such a policy would violate the *principle of competitive neutrality*.

58. I will defer expansive discussion of the "presumption of efficiency" with respect to the incumbent provider's actual, forward-looking costs to the next section. I

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[72] For our purposes here, we assume that the incumbent provider is operating with excess capacity so that short-run marginal cost is lower than long-run marginal cost and hence prices set equal to short-run marginal cost would not enable the incumbent provider to recover its capital costs.

[73] Alfred E. Kahn, Timothy J. Tardiff and Dennis L. Weisman, "The 1996 Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the FCC," *Information Economics and Policy*, Vol. 11(4), December 1999, p. 342.

will, however, make two observations here. First, the Commission's task in implementing the Telecommunications Act—that being one of market facilitator—is fundamentally different, and in fact a difference of kind rather than of degree, from the task of attempting to emulate a competitive market outcome through some form of economic regulation. Second, it is the marketplace and not the regulator that is the *final arbiter* of efficiency under the Telecommunications Act.

59. Finally, the use of hypothetical TELRIC in place of actual, forward-looking costs gives rise to a paradox in which the incumbent firm and other facilities-based carriers, including more efficient carriers, can be underpriced (foreclosed) by a rival using the incumbent firm's own network (*Principle 7)*. As I explained in my initial Declaration at ¶ 50, this is not a problem that is remedied by simply allowing the incumbent firm to price down to hypothetical TELRIC. Doing so only serves to foreclose efficient facilities-based entry—entry by those facilities-based firms with costs lower than the incumbent provider's actual costs, but higher than hypothetical TELRIC. This serves to underscore the fact that, contrary to the claims of the opposition economists, hypothetical TELRIC is inherently and unavoidably anticompetitive and therefore diminishes social welfare.

B. The Short-Run Costing Standard and Market Distortions[74]

60. The opposition economists contend that it may be appropriate for the incumbent providers to sell unbundled network elements to rivals at prices based on short-run costs.[75] The rationale for this position is two-fold. First, the TRO denies new entrants access to so-called "greenfield" technologies. Second, the capital costs associated with "legacy technologies" are sunk and hence efficient prices for unbundled network elements supplied using these technologies should appropriately reflect the unavoidable nature of these costs.

[74] *See* the Weisman Declaration at ¶¶ 22-28 for a more expansive discussion of why a short-run costing standard is not appropriate in this context.

[75] Pelcovits at 45-46.

61. The idea that prices for unbundled network elements should be based on a short-run costing methodology (that explicitly disavows capital costs) has previously been rejected by the Commission:

> We disagree with the conclusion that, when there are mostly sunk costs, forward-looking economic costs should not be the basis for pricing interconnection elements. The TELRIC of an element has three components, the operating expenses, the depreciation cost, and the appropriate risk-adjusted cost of capital. We conclude that an appropriate calculation of TELRIC will include a depreciation rate that reflects the true changes in economic value of an asset and a cost of capital that appropriately reflects the risks incurred by the investor. Thus, even in the presence of sunk costs, TELRIC-based prices are an appropriate pricing methodology.[76]

62. The distinction between "legacy technologies" and "greenfield" technologies is not always clear nor, for that matter, particularly helpful. It is necessary to carefully distinguish between the vintage of a particular technology and the functionality of that technology. The fact that "legacy technologies" can be used to supply unbundled network elements does not imply that the costs associated with provisioning those network elements are sunk. Moreover, attaching the label of "legacy technologies" to a particular set of assets does not necessarily imply that the incumbent providers are no longer investing in these technologies.[77]

63. The opposition economists appear to confuse the presence of sunk costs with the absence of value. Consider, for example, the market for commercial office space in urban cores. The costs associated with office buildings are largely sunk post-construction. And yet, despite the fact that markets for commercial office space are competitive, we do not typically observe lease prices based on a short-run costing standard (*i.e.*, that simply ignore the capital costs of the buildings) and for good reason.[78] As I observed in my Declaration at ¶ 27, "a firm that is forced to sell its products and services in a competitive marketplace at a price equal to short-run marginal cost over a prolonged period of time, either because of regulatory fiat or adverse market conditions,

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[76] *Local Competition Order* at ¶ 703 (footnote omitted).

[77] *See* Qwest Reply Comments at 25.

[78] As I discussed in my Declaration at ¶ 22, it may be efficient for a firm to price on the basis of short-run cost to utilize existing capacity most efficiently, but this is a transitional (disequilibrium) phenomenon.

will either fail to survive or will change the terms of the sales transaction between buyer and seller from on-demand to long-term contract." In other words, pricing on the basis of short-run marginal cost is unsustainable in equilibrium.

64. The Commission should not ignore how the financial community would react to the adoption of a short-run costing methodology (or the application of a long run methodology) for the pricing of network elements. If investors look upon this change in costing methodology as regulators somehow reneging on their commitment to allow the incumbent providers a fair opportunity to recover their costs,[79] they will tend to view investments in telecommunications networks as a riskier proposition. This, in turn, will bid up the risk premium embedded in the cost of capital and thus have a dampening effect on investment. The bottom line is that investors want their money back—hopefully with a positive return—and they tend not to look kindly upon a unilateral change in the "rules of the game" that has the effect of appropriating their funds. I have been openly critical in my writings of claims by incumbent providers that they necessarily have an entitlement to fully recover their costs; and I have been equally critical of opportunistic regulatory practices that are intended to ensure that they do not.[80]

65. As I observed in my original declaration at ¶ 23, firms will only invest if they perceive a fair opportunity to recover their investment, including the required cost of capital. In competitive markets, that decision will be made in advance of the point in time that the investment is actually made. If, as the CLECs suggest, the prices of unbundled network elements were to be set at short-run marginal cost—allowing for no

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[79] This raises issues related to *investment-backed expectations*—the idea that incumbent providers invested in plant and equipment (inclusive of irreversible, cost-reducing innovations) with the expectation of a continuation in existing regulatory policies. *See*, *for example*, Gregory J. Sidak and Daniel F. Spulber, *Deregulatory Takings and the Regulatory Contract,* Cambridge University Press: Cambridge, MA, 1997, pp. 12, 224-26 and 275-76. In *Verizon v. FCC*, the U.S. Supreme Court upheld the Eighth Circuit Court of Appeals on their finding that the claims by the incumbent providers that the TELRIC standard would result in a governmental taking was not yet "ripe." 535 U.S. 467, 497. It is not inconceivable to believe that the adoption of a "TESRIC" (total element short-run incremental cost) standard by this Commission would have a "ripening" effect on this claim. [It is noteworthy that in his dissent, Justice Breyer concurred that no taking had occurred "at the present time" under the TELRIC standard. *Id.* at 539.]

[80] Dennis L. Weisman, "Did the High Court Reach an Economic Low in *Verizon v. FCC*?" *The Review of Network Economics*, Vol. 1(2), September 2002, pp. 90-105; Dennis L. Weisman, "Is There '*Hope*' for Price Cap Regulation," *Information Economics and Policy*, Vol. 14(3), September 2002, pp. 349-70; and Dale E. Lehman and Dennis L. Weisman, *The Telecommunications Act of 1996*: *The "Costs" of Managed Competition*, Boston: Kluwer, 2000, Chapter 7.

capital recovery—why would a rational firm ever invest another dime in telecommunications networks?

66. Finally, the Commission should not allow the new entrants to leverage the incumbent providers ("governmentally-imposed") obligation to "build ahead of demand" by pricing unbundled network elements on the basis of a short-run costing methodology. There is a long history of regulators disavowing sunk costs in order to provide their constituency with the "benefits" of artificially-low rates.[81] It is quite another matter—a difference of kind rather than degree—for regulators to engage in such an opportunistic disallowance of costs (absent any credible evidence that such costs were imprudently incurred) for the benefit of the rivals of the incumbent providers. This would in effect transform the governmental obligations imposed on the incumbent providers by the Telecommunications Act into instruments of anticompetitive behavior by forcing them to sink their costs so that the new entrants do not have to.[82] This would essentially give new entrants a "free-ride" on the investments of the incumbent providers and thereby undermine incentives for investment in facilities-based networks. In other words, it would lead to market outcomes diametrically opposite that which the Congress intended.

VI. Price Caps and Efficiency

67. The incumbent providers have been operating under price cap regulation, a *high-powered* regulatory regime, in both the federal and state jurisdictions for an extended period of time. This regulatory history suggests that the incumbent providers have strong incentives for efficiency in managing their network operations, capital investments and resource allocation decisions. Therefore, the incumbent providers' actual, forward-looking costs of providing network elements should be considered

[81] *See* the review of the economics literature on this subject provided in Debra Aron and William Rogerson, "The Economics of UNE Pricing," Section 3.2, Filed as Exhibit A to SBC's Comments in this docket, December 16, 2003.

[82] As I have previously observed, "the validity of a takings claim is not independent of the origins of the 'competition' that erodes the regulated firm's revenue streams." Dennis L. Weisman, "Is There '*Hope*' for Price Cap Regulation," *Information Economics and Policy*, Vol. 14(3), September 2002, p. 367.

"presumptively-efficient." In other words, it is reasonable to believe that the incumbent providers are as efficient as they know how to be.

68. The opposition economists take issue with the claim that the incumbent providers are "presumptively-efficient." They make essentially three arguments. First, the incumbent providers have not operated under *pure* price cap regulation in the sense that the linkages between earnings and prices are not completely severed;[83] that in fact, regulators do look at earnings in revisiting the level of the X-factor and some price cap plans include so-called "low-end" adjustments should earnings levels reach inordinately low levels. Second, the X-factor in the state jurisdictions has been set too low, which means that the incumbent providers have not been required to pass along to consumers in the form of lower prices the full magnitude of their realized productivity gains.[84] Third, price cap regulation is no substitute for "real competition." That, in fact, the threat of actually losing customers to rivals provides much greater discipline than that imposed by price cap regulation.[85] The arguments of the opposition economists may be partitioned into two categories: (1) Fallacious; and (2) Not Fallacious, but irrelevant. I address each of these arguments in turn.

69. The Commission has revised upward the X-factor in the price cap plan for the incumbent providers in the interstate jurisdiction, but these revisions have not necessarily been affected because of inordinately high earnings, but rather because of changes to the structure of the price cap plan (*i.e.*, elimination of sharing bands) and/or new data on productivity growth. State regulators have tended not to revisit the level of the X-factor in the price cap plans for the incumbent providers, and not all state commissions monitor the earnings levels of the incumbent providers. In fact, some state commissions deliberately avoid auditing earnings so as to ensure that there is no temptation to make modifications to the price cap plans on the basis of the realized earnings of the incumbent providers. As the past chairman of the Massachusetts Commission observes:

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[83] Selwyn Declaration at 14.

[84] *Id*. at 19-20.

[85] Willig Declaration at 53-54.

> The primary reason for not even calculating earnings was to avoid the temptation to recontract the plan. There was evidence that productivity could vary significantly on an annual basis, so the Commission recognized that there could be significant variations in earnings from year to year. If earnings were calculated, there could be more temptation or political pressure to conclude that the plan had failed based on reported earnings that were either above or below the level that the commission had deemed to be reasonable in evaluating the cast-off rates. Having concluded that reported earnings were largely irrelevant to an evaluation of the plan, the Commission did not want to see them calculated during the duration of the plan.[86]

70. There are a number of important trends in the U.S. telecommunications industry concerning the type of regulatory regimes that have been put in place. First, there has been a rapid and pervasive movement away from traditional rate-of-return regulation in the direction of price cap regulation and rate moratoria.[87] Notably, earnings sharing has been eliminated from virtually all price cap plans for the incumbent providers in both the federal and state jurisdictions. Finally, the duration of most price cap plans has been increasing over time. Hence, while the incumbent providers have not been subject to so-called *pure* price cap regulation in all jurisdictions, the degree of "impurity" in these price cap plans has clearly been decreasing over time. In other words, the incumbent providers have been operating under increasingly *high-powered* regulatory regimes.

71. There is considerable empirical evidence to suggest that the substitution of price cap regulation for traditional rate-of-return regulation has been accompanied by pronounced investment and modernization of local telecommunications networks.

> We find that, in general, more liberal regulatory environments lead to greater incentives to deploy modern equipment, and that LECs respond to those incentives. By analyzing regulatory environments in more detail, we find that price regulation (and in particular price caps) is a more potent regulatory mechanism than the standard earnings sharing

[86] Paul B. Vasington, "Incentive Regulation in Practice: A Massachusetts Case Study." *Review of Network Economics*, Vol. 2(4), December 2003, p. 459.

[87] David E. M. Sappington, "The Effects of Incentive Regulation on Retail Service Quality in the United States," *The Review of Network Economics*, Vol. 2(4), December 2003, Table 1.

> scheme. Indeed, we find that when associated with an earnings sharing scheme, price regulation is less effective in triggering infrastructure deployment than when it is implemented by itself. … We show that price regulation would have increased infrastructure deployment by approximately 100% in those states that by 1991 had not adopted any incentive regulation scheme. On the other hand, introducing earnings sharing schemes would not dramatically alter LECs' infrastructure deployment plans. These results raise questions about the effectiveness of a popular regulatory scheme and highlight the effectiveness of generic price-cap regulation.[88]

72. In a more recent study of the performance of incentive regulation, Ai and Sappington report some notable differences with earlier findings.[89] Specifically, they find that network modernization is more pronounced (in all dimensions) under earnings sharing regulation relative to traditional rate-of-return regulation. In addition, they find evidence of a complementary relationship between incentive regulation and competition.

> Notice, though that incentive regulation can introduce considerable downside financial risk by holding the firm responsible when realized revenues fall short of expected revenues and/or when realized costs exceed expected costs. This risk can be particularly pronounced when local competition is intense, because competition can reduce the revenues of incumbent local telecommunications suppliers and increase their unit costs (by the reduced scale of their operations). By increasing downside risk, local competition may increase the motivational effects of incentive regulation.[90]

73. The "low-end" adjustments that are a feature of some, but certainly not all, price cap plans need not materially distort incentives for efficiency if the probability that such low-end adjustments will be triggered is sufficiently small.[91] In other words, the fact that a price cap plan incorporates a possible adjustment for inordinately low (high) earnings does not in and of itself imply that there is a pronounced effect on

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[88] Shane Greenstein, Susan McMaster and Pablo Spiller, "The Effect of Incentive Regulation on Infrastructure Modernization: Local Exchange Companies' Deployment of Digital Technology." *Journal of Economics and Management Strategy*, Vol. 4(2), 1995, p. 189.

[89] Chunrong Ai and David E. M. Sappington, "The Impact of State Incentive Regulation on the U.S. Telecommunications Industry," *Journal of Regulatory Economics*, Vol. 22(3), September, 2002, pp. 133-60.

[90] *Id.* at p. 150.

[91] Dennis L. Weisman, "Is There '*Hope*' for Price Cap Regulation," *Information Economics and Policy*, Vol. 14(3), September 2002, p. 358.

incentives for efficient performance. To the extent that the triggers for regulatory intervention are set at inordinately low (high) earnings levels, the performance of the price cap plan will tend to approximate that of *pure* price cap regulation.

74. The opposition economists make the claim that the X-factor in the state jurisdictions has been set too low.[92] Consequently, the incumbent providers have purportedly not fully passed on to consumers in the form of lower rates the productivity gains that they have realized. This claim is irrelevant even if it were to be true. First, there is no theorem that states that the same X-factor should necessarily apply in both interstate and intrastate jurisdictions. To the contrary, to the extent that the Commission has set an X-factor in the interstate jurisdiction that exceeds industry-wide productivity growth, it may be necessary to set the applicable X-factor in the intrastate jurisdiction correspondingly lower.[93] Second, how does AT&T reconcile its claim that hypothetical TELRIC is valid because it has been subjected to extensive review and adoption by some state commissions with the fact that these very same commissions have repeatedly rejected AT&T's claims in state price cap proceedings that the X-factor for the incumbent providers is set too low?

75. Even assuming, in the absence of any credible evidence, that the X-factor in the state price cap regimes has been set too low, this has no significance for the productive efficiency properties of price cap regulation. The superior productive efficiency properties of price cap regulation derive from the fact that a price cap operates much like a *fixed-price contract*. In other words, because the price cap is exogenous to the behavior of the regulated firm, the regulated firm is the residual claimant for any cost savings and therefore has ideal incentives to operate efficiently.[94]

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[92] Selwyn Declaration at 20.

[93] *See* Jeffrey I. Bernstein and David E. M. Sappington. "Setting the X Factor in Price Cap Regulation Plans", *Journal of Regulatory Economics*, 16, 1999, pp. 5-25.

[94] In this context, the term *residual claimant* means that the regulated firm has claim to the entirety of the difference (residual) between its revenues and its costs just like any other firm operating in a competitive market. One difference, however, is that the regulated firm's prices are capped by the regulatory authority, whereas the forces of supply and demand determine the market price which each competitive firm treats as exogenous.

76. Within reasonable bounds, the efficiency properties of price cap regulation are independent of the actual level of the price cap. Should the price cap constraint be too stringent (the X-factor set too high), the regulated firm may have little or no incentive to invest in cost-reducing innovation.[95] Moreover, if the X-factor is set too high, the incumbent provider may be capital constrained and this will, in turn, reduce the source of internal funds used to finance the firm's network modernization and infrastructure improvements. In any event, this problem derives from the X-factor being set too high rather than too low. Dr. Selwyn's claim that an X-factor that is set too low will somehow lead to diminished productive efficiency on the part of the incumbent provider is completely baseless.

77. Professor Willig claims that price cap regulation is an imperfect substitute for actual competition in terms of providing strong incentives for efficiency. That, in fact, the incumbent providers must face the threat of actually losing market share to competitors in order to have the requisite discipline to operate efficiently. In addressing the possible differences between the incentives for efficiency under price cap regulation and those under competition, I observed in my Declaration that:

> This is not to suggest that the incumbent providers have necessarily eliminated all possible sources of inefficiency, but their incentives were clearly to have eliminated all known and discoverable sources of inefficiency. Hence, while additional efficiencies may well be found, there is no "scientific" basis for discovering them outside of the competitive market conditions that the Act seeks to foster.[96]

78. In addition to the incentives for efficiency provided by price cap regulation, the incumbent providers are disciplined by the reality and ongoing threat of intra- and inter-modal competition. The reality and continuing threat of competition can reasonably be expected to provide the incumbent providers with incentives for efficiency that closely parallel the pronounced incentives for efficiency that would be present in fully competitive markets. As Professor Joseph Schumpeter observed more than a half-century ago:

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[95] *See* Luis M.B. Cabral and Michael H. Riordan. "Incentives for Cost Reduction Under Price Cap Regulation." *Journal of Regulatory Economics*, Vol. 1, 1989, pp. 93-102.

[96] Weisman Declaration at note 78.

> It is hardly necessary to point out that competition of the kind we now have in mind acts not only when in being but also when it is merely an ever-present threat. *It disciplines before it attacks*. The businessman feels himself to be in a competitive situation even if he is alone in his field … In many cases, though not in all, this will in the long run enforce behavior very similar to the perfectly competitive pattern (emphasis added).[97]

79. An important implication of Professor Schumpeter's observation is that even a firm subject to a relatively *low-powered* regulatory regime (*e.g*., traditional, rate-of-return regulation) may be efficient if the reality and ongoing threat of competition is sufficiently strong. This implies that the "accommodative competitive entry" provisions of the Telecommunications Act in combination with emerging intermodal competition may serve to discipline the incumbent providers in a manner that is largely independent of the particular form of regulation under which they operate. In other words, the discipline imposed by the regulatory regime—a surrogate for competition—ultimately yields to the real thing.

80. The Commission itself has found that rates that were initially set on the basis of accounting or historical costs would be "at or close to economic cost levels" when subjected to price cap regulation for a significant period of time.[98] In other words, price cap regulation is sufficient to disengage rates from accounting costs and transform them into rates based on forward-looking economic costs. This would seem to support the idea that the incumbent providers' actual, forward-looking costs should be considered "presumptively-efficient."

VII. Cost of Capital

81. Professor Willig claims that according to the Commission's TRO, where there is a finding of impairment and hence the need to unbundle network elements, competitive supply is infeasible.[99] It therefore follows that the cost of capital used in TELRIC studies should not assume competitive market conditions because competition is infeasible. If competition is infeasible, as the argument goes, the incumbent providers

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[97] Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*, New York: Harper and Row, 1942, p. 85.

[98] *Local Competition Order* at ¶ 821.

[99] Willig Declaration at 55, 128.

bear limited risk in provisioning unbundled network elements and the cost of capital should accordingly be relatively low.

82. Professor Willig's claims are fallacious, both factually and logically. The Commission makes no such claim in the TRO that a finding of impairment for a particular network element necessarily implies that competitive supply for that particular element is infeasible. This is a fundamentally incorrect reading of the TRO. The TRO does not call for a finding of impairment and hence unbundling where competition is necessarily infeasible, but merely where competition has not yet materialized to a degree that would conclusively demonstrate otherwise. Professor Willig relies upon this false premise to argue that the incumbent providers bear only limited risks because there will be little or no competition for unbundled network elements.[100] The "logical" implication of Professor Willig's reasoning is that while the incumbent providers may suffer a loss on each unbundled network element that they sell they apparently can make it up on volume. To put Professor Willig's argument another way, a landlord that is required to pay tenants to reside in his building should somehow take solace in the fact that he has 100 percent occupancy.

83. Professor Willig supports the use of the actual cost of capital for the incumbent provider in a TELRIC study when he supports the use of purely hypothetical assumptions for all other model inputs What is the economic rationale for this opportunistic switching between actual and hypothetical inputs? There is absolutely no sound economic basis for this array of conflicting assumptions in the development of a proper TELRIC study.

84. The facts of the matter quite simply are that the risks that the incumbent providers face in this environment are pronounced and the cost-of-capital used in the development of proper TELRIC studies should properly reflect these unique risks. As I previously observed, along with Professor Alfred Kahn and Dr. Timothy Tardiff:

> There is every reason to believe, therefore, that the tendency for some proxy models introduced in arbitration and state regulatory proceedings purporting to measure TELRIC coming out consistently lower than the estimates by the ILECs of their own incremental costs are the

[100] *Id.* at 57.

> consequence of applying traditional regulatorily determined rates of depreciation and costs of capital, which would, for the reasons we have already given, be grossly insufficient to induce investors to construct entirely new systems from scratch, as we have suggested. For this very reason, considerations of economic efficiency and efficient competition alone – that is, entirely apart from the entitlement of the ILECs to recover their sunk costs reflecting the historically inadequate depreciation allowances – *require* that the prices charged to competitors be based upon the LECs' *actual* costs, including depreciation rates and costs of capital realistically reflecting the radical changes in their regulatory environment. To the extent that competitors can provide these inputs more efficiently than the LECs, this will fully preserve their incentive to do so and thereby promote efficient facilities-based entry.[101]

85. In my Declaration at ¶ 35, I stated that "The proposition that TELRIC should reflect the costs that the incumbent provider actually incurs in provisioning network elements to rivals necessarily implies that the cost-of-capital duly accounts for the risks that the incumbent provider bears." Notably, the cost-of-capital must take into account not only what is sold, but the terms under which it is sold—on-demand or long-term contract. I further argued in my Declaration that "a cost-of-capital that is characteristic of competitive market conditions may well understate the risks borne by the incumbent providers under the unique obligations imposed upon them by the provisions of the Telecommunications Act." A firm operating in a competitive market typically has a fair opportunity to "compete on the merits" and this opportunity has been denied the incumbent providers under hypothetical TELRIC. These rules, in concert with pervasive regulatory opportunism, have resulted in the prices for unbundled network elements being set at unrealistically-low levels and this further exacerbates the risks borne by the incumbent providers.[102]

86. First, the mere existence of a new telecommunications technology is not sufficient to devalue legacy investments to the extent claimed by hypothetical TELRIC. The market must perceive that pervasive deployment of the new technologies, as well as

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[101] Alfred E. Kahn, Timothy J. Tardiff and Dennis L. Weisman, "The 1996 Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the FCC," *Information Economics and Policy*, Vol. 11(4), December 1999, pp. 328-29.

[102] *See* the discussion in Section II. B., *supra*.

the cost-savings derived there from, are not only a possibility, but are in fact observed market realities.[103] And yet both Professor Willig and Dr. Pelcovits assert that the availability of a new technology can be expected to drive assets values and market prices down very quickly if not immediately,[104] but they provide no support for their claims. Moreover, it is disingenuous for the opposing parties to argue on the one hand that this virtual "instantaneous devaluation" of network assets will materialize as soon as the latest, greatest technology is available on the market and yet, on the other hand, cease virtually all investment in facilities-based networks that would make such a claim even remotely credible.

87. Second, the theory of contestability rests fundamentally on the assumptions of the absence of sunk costs and the feasibility of "hit and run" entry. In other words, there are assumed to be no barriers to entry or barriers to exit. These assumptions may be consistent with the production process in the market for commercial aviation, but certainly not telecommunications markets in which production facilities are of a highly non-fungible nature. This begs the question as to why Professor Willig would invoke the theory of contestability to justify the use of hypothetical TELRIC (and an instantaneous devaluation of network assets) when the assumptions upon which the theory rests are manifestly not present in (wholesale) telecommunications markets.

88. Third, as I observed in my Declaration at ¶ 21, "any technology can be placed on the market (or alleged to be "theoretically feasible"), but a technology that has actually been deployed on a scope and scale comparable to that experienced by an ILEC presumably passes some further test of validity." These are precisely the conditions that would seemingly render such new technologies contestable. Finally, technological forecasting is notoriously difficult and fraught with errors—lest we forget AT&T's numerous, costly and ultimately unsuccessful forays into the development of picturephone.

89. In any event, Professor Willig's distinction between the assumption of a "contestable" market and the assumption of a "perfectly competitive market" has no

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[103] *See* the Supreme Court's reasoning on this very point in *Verizon v. FCC* at ¶ 18, *supra*.

[104] Willig Declaration at ¶ 27; Pelcovits Declaration at 14.

implications for the cost of capital. What matters are his assertions about the effect of new technologies on the valuation of the incumbent providers' legacy investments. Let us assume for the sake of argument that those assertions are correct. What would the financial community expect, in terms of compensation, to invest in telecommunications networks that can be instantaneously devalued by the mere presence of the latest, greatest technology on the market? First, whatever the quantitative answer is to this question, the qualitative answer is a cost of capital significantly higher than that which was previously deemed appropriate under "regulated monopoly" market conditions when entry was expressly restricted by regulatory decree. Second, the necessary implication is that the initial price of unbundled network elements would have to be set significantly higher than the incremental cost of such elements to account for the expected rapid decline in the value of the underlying assets over time.[105] Either a more modest cost of capital is applied to the incumbent providers actual investments; or a higher cost of capital is applied to the incumbent providers "legacy investments" that are purportedly devalued instantaneously by the appearance of new technologies on the market. Professor Willig has failed to demonstrate that the efficient prices for unbundled network elements would necessarily be lower under the market conditions he believes to be the most realistic.

90. The bottom line here, of course, is that investors like to get their money back, hopefully with some positive return. The less likely this outcome is perceived to be by the investment community as a whole, the greater the risk-premium that investors will demand and the higher the cost of capital, *ceteris paribus*. The United States Supreme Court's ruling in *Verizon v. FCC* is a two-edged sword for the Commission. On the one hand, the Court ruled that TELRIC does not run afoul of statutory intent. On the other hand, investors now understand that the Court has given them no safe harbor when state regulators take their money away through opportunistically-low prices for unbundled network elements. In other words, investors know when they have been "taken"

[105] David M. Mandy and William W. Sharkey, "Dynamic Pricing and Investment from Static Pricing Models," *The Review of Network Economics*, Vol. 2(4) December 2003, pp. 411-12.

regardless of what the Supreme Court may have concluded as to whether a *governmental taking* has actually occurred.[106]

91. The "game" is now perceived as being riskier and, as a result, investors will have to be paid more if we want them to play. The implication being that efficient prices for unbundled network elements may well be higher under hypothetical TELRIC, than they would be under a less open-ended costing methodology ("on a cost inquiry that is more firmly rooted in the real-world attributes of the existing network"[107]) once proper account is taken of the differences in the risk premium demanded by investors. As the Nobel Laureate Milton Friedman reminds us, "there is no such thing as a free lunch," nor, for that matter, a "free appropriation."

92. Finally, the opposing economists appear to be mired in a past world in which there is no telecommunications competition. They contend that the incumbent providers are not subject to the same competitive risks that exist in other markets even though there has been significant loss of market share. Erosion of market share is a significant risk for a capital-intensive firm, particularly when the production process is characterized by a high-proportion of fixed and sunk costs. The "accommodative competitive" entry provisions of the Telecommunication Act were specifically designed to eliminate both entry and exit barriers for new-entrants and thereby stimulate competition. This means that CLECs can enter and, even more importantly exit, the market at will, thereby forcing the incumbent providers to serve as the carriers-of-last resort for the costs that they leave behind. One would be hard-pressed to identify any other industry or market in which the incumbent providers are exposed to a comparable degree of asymmetric risk-bearing.

VIII. Structure Sharing

93. The structure sharing issue has figured prominently in the debate over the appropriate inputs to use in conducting a proper TELRIC study. Professor Willig

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[106] For an economic critique of the Court's ruling on the taking issue, see Dennis L. Weisman, "Did the High Court Reach an Economic Low in *Verizon v. FCC*?" *The Review of Network Economics*, Vol. 1(2), September 2002, pp. 99-102.

[107] NPRM at ¶ 4.

contends that, consistent with the "long-run" perspective of TELRIC, it is appropriate to assume that the efficient incumbent provider would only be responsible for one-third of the total costs of the structure (poles, conduit, etc.).[108] The remaining two-thirds of the costs of the structure would purportedly be borne by the natural gas and electric power companies. Professor Willig's characterization of the long-run is logically flawed and hence his conclusion that an efficient incumbent provider would be responsible for only one-third of the total costs of the structure is patently incorrect.

94. By definition, the long-run is a period of time over which the firm is able to vary all of its inputs to production. The "long-run" can vary from one firm to another in a given market and is largely, if not completely, independent of firms in unrelated markets. Professor Willig misconstrues the long-run to represent a period of time over which: (1) The government centrally plans and coordinates the construction of utility structures and just happens to allocate equal shares of the costs to the telephone, natural gas and electric power companies; or (2) The telephone, natural gas and electric power companies merge so there is no coordination problem across the utilities in building structures; or (3) The "long-run" for the telephone, natural gas and electric power companies just happen to coincide with another.[109] None of these scenarios is plausible, or has any legitimate public policy purpose, and should be rejected outright by the Commission.

95. Professor Willig's analysis is reminiscent of the old joke about a physicist, an engineer and economist stranded on a remote island with one can of food, but alas no can opener. Each ponders how the tools of his trade might be useful in opening the can of food. The physicist reasons that it should be possible to calculate the vector forces that would be required to use the waves rolling up on the beach in combination with the rocks on the shore to open the can. The engineer believes that it should be possible to construct a catapult with the native palm trees on the island to fling the can against the near-by mountains and thereby open the can. The economist suggests that we should just assume the existence of a can opener!

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[108] Willig Affidavit at 44.

[109] Even in this highly unlikely scenario, it would be necessary to include in the TELRIC measure the transaction costs incurred in coordinating these activities across independent entities.

> Hypothetical TELRIC, much like the fictional can opener, attempts to "solve" the problem by assuming it away.[110]

Just as the fictional can opener is of no help in opening the can of food, hypothetical TELRIC is of no help in providing the correct economic signals to would-be market entrants. In fact, hypothetical TELRIC, unlike the fictional can opener, is actually counterproductive and socially harmful precisely because it discourages entry that would actually lower society's costs of producing telecommunications services.

96. The bottom line is that there is no economic principle supporting Professor Willig's claims that structure sharing costs would necessarily be shared equally with the other utilities in the long run. In fact, such an assumption is entirely inconsistent with providing correct economic signals to would-be entrants. No new entrant could expect to push off the vast majority of its placement costs onto other entities. The Commission should accordingly give no weight to Professor Willig's contentions regarding the sharing of structure costs.

IX. Truthful Reporting of Costs

97. The opposition economists claim that one important justification for the use of hypothetical TELRIC is that of informational asymmetries—the incumbent providers presumably know more about their own costs than do regulators and new market entrants and this information can be used strategically to secure an unfair competitive advantage.[111] And yet, the incentive for the incumbent providers to overstate their costs is not unequivocal (*Principle 6*). As I observed in my Declaration at ¶ 47:

> Overstating costs encourages the construction of facilities-based networks and endogenously increases the likelihood that the incumbent supplier will be forced to compete against a facilities-based provider while, at the same time, being constrained to operate with an artificially-high price floor. Understating costs discourages the

[110] This is precisely what Professor Ronald Coase refers to as "blackboard economics"—theory devoid of fact. Ronald H. Coase, *The Firm, The Market and the Law.* Chicago: University of Chicago Press, 1988, pp. 28-29. For an insightful discussion of "blackboard economics" in the context of utility regulation, and the implementation of the Telecommunications Act, in particular, *see* Raymond L. Gifford. "Regulatory Impressionism: What Regulators Can and Cannot Do," *The Review of Network Economics*, Vol. 2(4), December 2003, pp. 46-479.

[111] Pelcovits Declaration at 19, 31; Willig Declaration at 10.

> construction of facilities-based networks and increases the likelihood that the incumbent provider will be forced to supply unbundled network elements to rivals at non-compensatory prices for "eternity."

98. Moreover, "Whatever problems and informational asymmetries may attend the use of the incumbent provider's actual, forward-looking costs, they are far outweighed by the inherent (un)verifiability of hypothetical TELRIC" (*Principle 6*). In other words, asymmetrical information is likely better than no information at all. It should be recognized that this is a particularly serious problem when there are pronounced incentives for "regulatory opportunism." State regulators can exploit the informational vacuum surrounding hypothetical TELRIC to justify virtually any prices they deem appropriate for unbundled network elements by simply appealing to the notion that "anything is possible"—apparently, even an instantaneous 70 percent reduction in operating costs for an incumbent provider that has operated under price cap regulation for an extended period of time.[112]

99. Whereas, the incumbent providers' incentive to overstate costs is not unequivocal, the CLECs' incentives to understate the incumbent providers' costs are unequivocal. The CLECs using UNEs and participating in the relevant state commission proceedings have no incentive to provide accurate estimates of the costs underlying UNE prices. The contentions of the new entrants that they would rather not be dependent upon the incumbent providers' facilities misses the point.[113] The real question concerns whether, with prices for unbundled network elements based on hypothetical TELRIC, they can afford not to be?

100. There is yet another more subtle problem with the use of hypothetical TELRIC and the incentives that it creates for new entrants to understate the incumbent providers' costs. The hypothetical, unverifiable nature of TELRIC in combination with

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[112] *See* the Comments of Qwest Communications International Inc. in response to the Notice of Proposed Rulemaking, *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers*, WC Docket No. 03-173, December 16, 2003, p. iii.

[113] *UNE Remand Order* at ¶ 112.

the notion that "anything is possible" gives rise to a problem of "moral hazard."[114] The new entrants may have limited incentives to operate efficiently because they can always appeal to the state regulators for relief (i.e., lower prices for unbundled network elements) They do so because they understand that agencies do not want to see competitive experiments fail. This is not a new problem. In fact, a previous Commission encountered this problem when overseeing the transition to competition in long-distance markets:

> A firm does not have to possess large market share to exercise economic power. The OCCs [other common carriers] do not possess large market shares, but they can certainly exercise power by threatening to make government officials who have inflicted huge costs on consumers to promote competition look bad. They can do this by threatening to fail. A small market share and low profits can be assets in such an extortion campaign. They can make the threat of failure more compelling and thus make it more likely that government officials will yield to extortionate demands. And as is always the case with extortionists, giving in merely encourages additional blackmail attempts.[115]

X. Non-Recurring Costs

101. Economic efficiency requires that the price for a good or service reflect the actual resource costs borne in producing that good or service. An immediate corollary to this principle is that efficiency requires that the structure of prices reflect the structure of costs (*Principle 8*). This principle is simply a restatement of the familiar *cost-causation principle* and requires that recurring costs be recovered in the form of

[114] A moral hazard is a particular incentive problem that arises when the economic agent does not bear the full costs of a loss and, as a result, fails to put forth the efficient level of effort (which cannot be observed directly) to avoid that loss. For example, an individual may not take adequate precautions in locking the doors on his rental car or parking the rental car so as to avoid parking lot damage because he does not pay the full cost in the event of theft of damage. The moral hazard problem explains why most insurance policies require co-payments or deductibles.

[115] John Haring, "The FCC, the OCCs and the Exploitation of Affection," Working Paper No. 17, FCC Office of Plans and Policy, June 1985. This paper was written, in part, as a response to a study that suggested the prospects for effective competition in the long distance market were in severe jeopardy. *See* Booz, Allen and Hamilton, Inc., "Prospects for Major Facilities-Based Other Common Carriers," 1985. A number of the OCCs concurred in the findings of this study.

usage-sensitive prices; and that non-recurring costs be recovered in the form of one-time (non-recurring) charges.[116]

102. The opposition economists argue that this distinction between recurring and non-recurring costs is not always clear. Consider, for example, the case of line conditioning—a feature required for broadband functionality. They claim that all future customers of that line will benefit from the line being conditioned, not just customers of the new entrant making the initial request for line conditioning. The relevant economic issue concerns not the stream of customers that may benefit from the line conditioning, but the fact that the costs are caused by the new entrant making the request; these are one-time, non-recurring costs and efficiency dictates that they be recovered in the form of one-time (non-recurring) charges.

103. The issue to which the opposition economists allude is not unique to the market for local exchange telephone service, but is in fact common in unregulated, competitive markets. Consider, for example, the case of retail office space. It is common for new tenants to make improvements to the office space (i.e., remodeling, plumbing, electrical work, painting, heating and ventilation etc.), the benefits of which may well transcend the length of the lease and (in)directly benefit future tenants. Landlords do not typically subsidize these improvements even though they likely serve to enhance the value of the property.

104. The issue to which the opposition economists allude—that of the benefits of line conditioning to customers—has no significance in terms of cost causality. Moreover, it raises issues of asymmetric risk-bearing. For instance, suppose that demand for conditioned lines falls off and there are no future customers for conditioned lines. The incumbent provider would be responsible for bearing costs that it did not cause to be incurred—a violation of the *cost-causation principle*. Hence, the outstanding question concerns why the incumbent provider rather than the new entrant should be forced to bear the risk associated with demand uncertainty?

[116] The Commission recognizes at ¶ 115 of the NPRM "that, as a general rule, rates for unbundled network elements should recover costs in the manner in which they are incurred."

105. This issue of non-recurring costs highlights another important issue related to the fact that the new entrant typically leases the network element for a "contract period" shorter than the economic life of the network facilities. This creates a problem of "moral hazard" because the new entrant does not pay the full cost of the resources that it consumes—either because the prices for unbundled network elements are below their actual, forward-looking costs, or because the length of the contract is of shorter duration than the economic life of the facilities. The problem derives from the fact that the new entrant may fail to exert sufficient effort to retain the customer, or fails to retain the full complement of services that the customer has ordered because it does not bear the full costs of the facilities. In this case, the incumbent provider is truly the "carrier of last resort"—the carrier of the costs that the new entrant leaves behind but nonetheless caused to be incurred.

106. A closely related issue concerns the recovery of so-called "competition onset costs." These are costs that the incumbent providers incur in order to render their networks capable of serving multiple retail carriers. AT&T intimates that the Congress is the "cost-causer" for these "competition onset costs" because these costs were incurred in order to comply with the provisions of the Telecommunications Act—which the Congress passed.[117] This is akin to arguing that regulators are the cost-causers for deploying telecommunications networks because they require the incumbent providers to invest ahead of demand in order to comply with their carrier-of-last resort obligations. The fact of the matter is that the Congress is serving as an agent for the CLECs in the very same manner that the regulator serves as agent for end-use customers. In both cases, it is the CLECs and the end-use customers, respectively, that are the true cost-causers.

107. A serious problem of "moral hazard" arises when the CLECs have what amounts to a "blank check" for network upgrades and modifications. This would encourage the CLECs to make "excessive" demands on the incumbent providers for network upgrades and modifications because they are not being assessed the full resource costs that they cause to be incurred. It violates the principle of *competitive neutrality* to

[117] Murray Declaration at 92.

require incumbent providers (and their customers) to subsidize what are essentially customized product enhancements for new entrants.

108. Finally, there is potentially an even more sinister problem with recovering non-recurring costs in the form of recurring charges. This concerns the fact that the new entrant may have incentives to exaggerate demand for unbundled network elements at prices based on hypothetical TELRIC. To the extent that the contract length is shorter than the economic life of the facilities, the incumbent provider may be unable to resell the requested facilities and therefore must bear the costs incurred on behalf of the new entrant. This is a type of strategic behavior known formally in the economics literature as "raising rivals' costs."[118] I am not suggesting that new entrants necessarily engage in this type of strategic behavior; I am merely pointing out that there may be incentives for such behavior under the pricing schemes advocated by the opposition economists.

XI. Other Costing Issues

A. Expense Factors

109. It is an unfortunate fact of life in state regulatory proceedings that factors and investment levels are relied upon to estimate operating expenses. I say "unfortunate" because there is no good science of which I am aware to establish any correlation between network investment and operating expenses, or changes in such investment and expenses (holding volumes constant). In other words, there is no universal principle that recognizes a correlation between investment and expenses. In fact, the logic of mirroring investment cost reductions in operating costs is inherently suspect. Because network investment is "lumpy" and long-lived, the one-time cost reduction that results from switching to a new technology is relatively large. Expenses are not subject to the same degree of instantaneous reduction. Hence, expenses may be expected to fall more slowly than the hypothetical reduction in investment costs that results from changing technologies.

[118] Stephen Salop and David Scheffman, "Raising Rivals' Costs." *American Economic Review*, Vol. 73, pp. 267-71; and Thomas Krattenmaker and Stephen Salop, "Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power Over Price," *Yale Law Journal*, Vol. 96(2), pp. 209-93.

110. This problem is further exacerbated by the fact there is a compounding of errors that can create additional downward bias in the TELRIC estimates. For example, understating required investment will necessarily lead, through the use of factors, to an under-estimate of expenses. A simple example may prove instructive. Suppose the actual investment and operating expenses are $100 and $50, respectively. This implies an expense factor of 0.5 (50/100). Suppose now that upon appeal to hypothetical TELRIC, investment is estimated to be $60. The implied operating expense, estimated through the use of the factor, is $30. Hence, the incumbent provider is able to recover only $90 when its total cost is $150. Alternatively, if the error was confined only to investment—which would be the case if the expense factor were not utilized—the incumbent provider would have been able to recover $110 when its total costs are $150. This is the manner in which expense factors compound any errors that may arise in estimating required investment. Moreover, the use of factors explains why state regulators can seemingly approve an instantaneous 70 percent reduction in operating expenses for an incumbent provider that had been operating under price cap regulation for an extended period of time.[119]

B. Inclusion of Spare Capacity for Growth in TELRIC Studies

111. Another costing issue that arises in state regulatory proceedings to establish prices for network elements concerns the inclusion of spare capacity for growth. Carrying spare capacity implies that the expected fill factor is lower and the effective TELRIC measure is correspondingly higher, *ceteris paribus*. In many cases, it will prove to be more efficient for the provider to carry excess capacity rather than have to retrofit existing facilities to satisfy actual demand. Hence, it is not sufficient for a new entrant to claim that if the incumbent provider had only excluded spare capacity, the TELRIC measure and hence the price of the unbundled network element would have been lower. In fact, the proper calculation of TELRIC should duly account for the expected costs of

[119] *See* the Comments of Qwest Communications International Inc. in response to the Notice of Proposed Rulemaking, *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers*, WC Docket No. 03-173, December 16, 2003, p. iii.

having to retrofit existing facilities for relief purposes in the absence of carrying spare capacity.

112. A simple, stylized example should once again prove instructive. Suppose the investment costs for supplying a maximum of 10 loops and 16 loops is $100 and $130, respectively. There are assumed to be no other costs. There are two states of the world, a low-demand state in which the actual demand for loops is 8, and a high-demand state in which the actual demand for loops is 12. Suppose that the two states of the world are equally likely. If the incumbent provider builds for the low-demand state and the low-demand state is realized, the effective loop cost is $12.50 and the fill factor is 80%. If the incumbent provider builds for the high-demand state and the low demand state is realized, the effective loop cost is $16.25 and the fill factor is 50%. If the incumbent provider builds for the high-demand state and the high-demand state is realized, the effective loop cost is $10.83. Finally, if the incumbent provider builds for the low-demand state and the high-demand state is realized, a retrofit of the existing network is required at a cost of $K. The new entrants claim that TELRIC measures should not include spare capacity on the network. And yet, in a substantial number of cases, the expected costs will be lower with the carriage of spare capacity than they would be if a retrofit of the network is required. With reference to our example, this will be the case when $13 < 0.5[$100/8] + 0.5[($100 +$K)/12],[120] or K > $61.95.

113. The implication, of course, that it is not possible to simply ratchet upward the fill factor and hence lower the effective TELRIC measures simply by eliminating spare capacity. If the spare capacity is eliminated, the proper measure of TELRIC should properly account for the increased probability of having to retrofit the existing network in order to serve a higher level of realized demand. If these retrofit costs are "sufficiently high," it may prove to be more cost-effective to build in spare capacity initially, despite the lower fill factors that may result. It follows from this discussion that market signals will be distorted if the TELRIC measures do not properly account, either for the inclusion of spare capacity, or, in the alternative, the exclusion of spare capacity but the inclusion

[120] The $13 is derived by dividing the investment costs for the high-demand state ($130) by the expected demand of 10 lines.

of the expected costs associated with retrofitting the network should the high-demand state of the world be realized.

XII. Summary and Conclusions

114. The Telecommunications Act empowers the Commission to implement a deregulatory statute, not a new form of regulation. This distinction is absolutely critical and lies at the very core of the complex issues under review in this proceeding. Indeed, the Commission must carefully distinguish between its role as a traditional regulator and its role as a market facilitator. In the former, the Commission seeks to emulate the competitive market outcome; in the latter, the Commission seeks to foster the competitive process.

115. There is no foundation for the claim by the opposition economists that the U.S. Supreme Court, or any other court for that matter, has validated hypothetical TELRIC. The fact of the matter is that the Supreme Court could not have been more clear that it was ruling on the legality of TELRIC and not the underlying economics of TELRIC. Furthermore, the fact that some state commissions have reviewed and subsequently adopted the hypothetical TELRIC methodology cannot and should not be dispositive in establishing the validity of hypothetical TELRIC. The fact of the matter is that state commissions have strong incentives to set prices for unbundled network elements at artificially-low levels, particularly in jurisdictions where the incumbent providers operate under price cap regulation.

116. I stated in my Declaration that "The principal objectives of the Telecommunications Act are best achieved by pricing rules that promote the development of efficient facilities-based competition." This observation notwithstanding, second-best considerations suggest that an efficient marketplace outcome may well be consistent with some degree of "overinvestment" in facilities-based entry. This is particularly likely to be the case when the costs of regulation and litigation in the absence of facilities-based entry are pronounced.

117. The Commission's decisions as well as those of the courts have underscored the importance of ensuring that prices for unbundled network elements strike

the appropriate balance—encourage investment and innovation on the one hand, while avoiding uneconomic duplication of facilities and promoting both intra- and inter-modal forms of competition on the other. It is now apparent that the pervasive adoption of hypothetical TELRIC has upset this balance in favor of encouraging mere resale and discouraging investment in facilities-based networks.

118. The claim by Professor Willig that lower prices for unbundled network elements [actually] stimulates investment does not stand up to scrutiny. Professor Willig's errant finding is the artifact of a mis-specified model, as Professor Lehman demonstrates in his declaration. In addition, the share prices of narrowband equipment manufacturers dropped precipitously on news of the Commission's decision to continue UNE-P. Finally, the Commission's own competition report reveals a dramatic reduction in the growth of facilities-based lines and a corresponding increase in the growth of UNE-P lines.

119. The prices for unbundled network elements should be based on the actual, forward-looking costs of the incumbent provider. This costing standard gives competitors the proper target at which to set their sights. If competitors have lower costs than the incumbent provider, their entry into the market will enhance social welfare by enabling society to produce a given quantity of telecommunications services with fewer scarce resources. The use of hypothetical TELRIC to set prices for unbundled network elements is fundamentally anticompetitive precisely because it discourages entry that would lower society's actual costs of producing telecommunications services. The prices for unbundled network elements should be based only on costs that have objective reality; that is, costs that comport with the facts on the ground. (*Principle 3*).

120. There is no economic foundation to the claim by the opposition economists that prices for unbundled network elements should be set on the basis of short-run costs. Such a pricing policy would enable new entrants to "free-ride" on the incumbent providers investments and, in turn, discourage investment in facilities-based networks. The distinction between so-called "legacy" technologies and "greenfield" technologies is perhaps unfortunate because it may be misconstrued to suggest that the only investment taking place is in the latter and this is simply not the case. In fact, if the

incumbent providers are denied any opportunity to recover their currently invested capital, it is a virtual certainty that they will have neither the funds nor the inclination to invest in any technologies—legacy or "greenfield." In any event, the notion that prices should be based on short-run costs when a large share of the costs of providing unbundled network elements is sunk has previously been rejected by the Commission.

121. Similar problems arise if basic telephony is treated as a mere by-product of investment in more advanced telecommunications services. The incumbent providers make their investment decisions on the basis of anticipated future revenue streams. The primary source of revenues for the incumbent providers, now and in the foreseeable future, is that which derives from basic telephony. Treating basic telephony as a mere by-product of a future "greenfield" network in order to justify prices for unbundled network elements that allow for little or no capital recovery will serve only to stifle the very investment in advanced telecommunications services that the Congress and the Commission seek to encourage.

122. The claim by the opposition economists that the incentives for efficiency under price cap regulation are an imperfect substitute for the incentives for efficiency under competitive market conditions evokes two responses: (i) "perhaps"; and (ii) "so what". The primary objective of economic regulation is to emulate a competitive market outcome and price caps is increasingly the regulators' instrument of choice. The incentives for efficiency provided under price cap regulation in concert with the actuality and ongoing threat of intermodal competition should provide incentives for efficiency that closely approximate those of a competitive market. It is not inconceivable that additional efficiencies can be and will be discovered, and yet it is the marketplace and not the regulator that is the *final arbiter* of efficiency under the Telecommunications Act.

123. The opposition economists claim that the TRO states that where there is a finding of impairment for a particular network element and unbundling is required, competitive supply is infeasible for this particular network element. The TRO says no such thing. The opposition economists use this false premise to argue for a relatively low cost of capital in TELRIC studies. In fact, it is essential that the cost of capital used in TELRIC studies duly account for the unique risks that the incumbent providers bear

under the obligations imposed upon them by the Telecommunication Act, inclusive of the ongoing threat and actuality of opportunistic behavior by state regulatory commissions.

124. Recovering non-recurring costs in recurring (usage-sensitive) rates runs counter to the *principle of cost causation* and forces the incumbent provider to underwrite the financial obligations of the new entrants. Moreover, such a pricing policy creates a problem of "moral hazard" by requiring the incumbent provider, rather than the new entrant, to bear the risks associated with customer retention and demand uncertainty. Moreover, the Commission's pricing rules should not favor new entrants over incumbent providers, nor should they favor network-element based entrants over facilities-based entrants. Subsidizing unbundled network element prices serves only to disadvantage facilities-based providers and further creates problems with respect to asymmetric risk-bearing.

125. The recovery of "competition onset costs" should not have the effect of hobbling incumbent providers. The incumbent providers should not be forced to bear the costs for network upgrades and modifications that go beyond that which is required to remain in compliance with the Telecommunications Act. This would serve only to encourage CLECs to make "excessive" demands for network upgrades and modifications because they are not being assessed the full resource costs that they cause to be incurred. In other words, it would create a potentially serious problem of "moral hazard."

126. There is no economic foundation for Professor Willig's claim that the costs associated with structures would be shared equally with the other utilities in some long-run equilibrium. The long-run, by definition, is a period of time over which the firm considers all inputs to production variable; it is specifically not a time period over which a fictional merger occurs to justify a particular assumption about costs, or the existing market economy is magically transformed into a centrally-planned one. In fact, most of the evidence from around the planet suggest that the direction of change is from centrally-planned economies to market economies and not the other way around. The Russian economy no longer operates under five-year master plans and there would seem

to be precious little basis upon which to recommend that we resurrect them in this country for the sole purpose of implementing the Telecommunications Act.[121]

127. The incumbent providers' incentives to overstate their costs are not unequivocal, but the new entrants do have unequivocal incentives to understate the incumbent provider's costs. Indeed, their actions belie their words. They claim that they do not wish to be dependent on the incumbent providers' networks, but then proceed methodically to beat down the prices for unbundled network elements to such unrealistically-low levels that they can hardly afford not to be. Furthermore, the hypothetical, unverifiable nature of TELRIC exploits an informational vacuum and gives rise to a problem of "moral hazard." The new entrants may have limited incentives to operate efficiently because they can always appeal to the state regulators for relief (i.e., lower prices for unbundled network elements) should they suffer financial distress. In other words, they can secure progressively lower unbundled network element prices by threatening to fail.

128. The use of so-called expense factors is pervasive in regulatory proceedings to establish prices for unbundled network elements. The use of these factors compounds any errors in estimating the investment required to serve a specified level of demand. In other words, understating investment leads, through the use of factors, to understated operating expenses and the compound effect can be to dramatically reduce TELRIC measures and thereby produce unrealistically-low prices for unbundled network elements.

129. It is incorrect for the new entrants to claim that higher fill factors that derive from excluding spare capacity in TELRIC studies would necessarily lead to lower cost estimates and thus lower prices for unbundled network elements. In fact, a proper calculation of TELRIC should duly account for the expected costs of having to retrofit existing facilities to serve a higher level of demand should the initial construction of the network not include spare capacity.

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[121] *See*, *for example*, Daniel Yergin and Joseph Stanislaw, *Commanding Heights*,. Simon & Schuster: New York, 1998.

130. As a final observation, I note that cost estimation by its very nature is subject to significant uncertainty and absolute precision is beyond our reach. This does not mean that we should as a matter of public policy deliberately eschew "good-faith" efforts to estimate such costs with as much precision as can reasonably be justified upon appeal to cost-benefit principles. To this end, the Commission should adopt an approach that bases prices for unbundled network elements "on a cost inquiry that is more firmly rooted in the real-world attributes of the existing network." By taking this action, the Commission will have come down firmly in favor of *predictive judgment* and against *wild speculation* in estimating the costs of unbundled network elements. It is then and only then that we can return to the important task at hand—that of developing meaningful measures of TELRIC—and dispense with what have all too often become elaborate exercises in "competitive handicapping" that are intended to give the appearance of science but in reality are anything but.