PARAMETER VALUES	QUESTION 2(b)*
COST OF CAPITAL	Study Values
DEPRECIATION	Study Values
STOCK ADJUSTMENT	2(b)*: All=0.2

	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1984						
1985	−5.2%	0.5%	−5.7%	0.2%	4.0%	−3.8%
1986	−2.0%	1.0%	−3.0%	1.7%	3.8%	−2.1%
1987	−2.5%	0.1%	−2.6%	−0.6%	3.1%	−3.7%
1988	−1.5%	0.6%	−2.1%	−2.7%	4.4%	−7.1%
1989	−0.8%	−0.3%	−0.5%	−3.2%	4.1%	−7.3%
1990	3.0%	−0.3%	3.3%	7.8%	4.2%	3.6%
1991	−0.6%	−1.1%	0.5%	2.0%	2.9%	−0.9%
1992	2.3%	1.9%	0.4%	3.0%	5.1%	−2.1%
*1993	1.3%			−1.6%		
*US numbers not available for 1993						
Avg 84−92	−0.9%	0.3%	−1.2%	1.0%	4.0%	−2.9%
Avg 84−93	−0.7%			0.7%		
Avg 85−93	−0.1%			0.8%		

FIVE−YEAR ROLLING AVERAGES

5−year avg ending in	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1989	−2.4%	0.4%	−2.8%	−0.9%	3.9%	−4.8%
1990	−0.8%	0.2%	−1.0%	0.6%	3.9%	−3.3%
1991	−0.5%	−0.2%	−0.3%	0.7%	3.7%	−3.1%
1992	0.5%	0.2%	0.3%	1.4%	4.1%	−2.8%
**1993	1.0%	0.2%	0.9%	1.6%	4.1%	−2.5%

**1993 US numbers are latest 5−year average

This scenario is a complement to scenario 2(b) and arbitrarily changes the economic stock adjustment factors all to 0.2 (the lowest value possible without obtaining negative capital stocks. As requested by the FCC staff, Christensen Associates performed an analysis by changing the economic stock adjustment factor to 1.0 in scenario 2(b) and changed the factor to 0.2 in this scenario. Arbitrarily changing the economic stock adjustment factor is inconsistent with the 1984−1993 capital computations and results in an incorrect TFP number. (FOOTNOTE TO SCENARIO 2(b)* CONTINUED ON NEXT PAGE)

FOOTNOTE TO SCENARIO 2(b)* – CONTINUED

5–year rolling averages for TFP are also calculated. The FCC also requested 5–year rolling average of LEC total input prices and 5–year rolling averages of the rate of growth of U.S. private business sector input prices. The input prices for the LECs are a residual calculation and are not the main focu of the productivity study. The productivity study primarily focuses on quantities of output and input. USTA will file an affidavit by Dr. Laurits R. Christensen explaining why an input price adjustment is inappropriate in the LECs price cap formula.

This table also includes average annual growth rate calculations for the 1984–1992, 1984–1993, and 1985–1993 periods as requested by the FCC staff.

PARAMETER VALUES	QUESTION 4(a)
COST OF CAPITAL	1(a): FCC ROR
DEPRECIATION	1(b): FCC 93
STOCK ADJUSTMENT	2(a): Add 0.1

	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1984						
1985	1.8%	0.5%	1.3%	3.9%	4.0%	−0.1%
1986	3.3%	1.0%	2.3%	7.6%	3.8%	3.8%
1987	2.5%	0.1%	2.4%	−1.1%	3.1%	−4.2%
1988	2.8%	0.6%	2.2%	−3.6%	4.4%	−8.0%
1989	2.5%	−0.3%	2.8%	−1.3%	4.1%	−5.4%
1990	4.9%	−0.3%	5.2%	10.7%	4.2%	6.5%
1991	1.6%	−1.1%	2.7%	1.3%	2.9%	−1.6%
1992	3.7%	1.9%	1.8%	5.6%	5.1%	0.5%
*1993	3.0%			−1.2%		
*US numbers not available for 1993						
Avg 84−92	2.9%	0.3%	2.6%	2.9%	4.0%	−1.1%
Avg 84−93	2.9%			2.4%		
Avg 85−93	3.0%			2.3%		

FIVE−YEAR ROLLING AVERAGES

5−year avg ending in	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1989	2.6%	0.4%	2.2%	1.1%	3.9%	−2.8%
1990	3.2%	0.2%	3.0%	2.5%	3.9%	−1.4%
1991	2.8%	−0.2%	3.0%	1.2%	3.7%	−2.5%
1992	3.1%	0.2%	2.9%	2.5%	4.1%	−1.6%
**1993	3.1%	0.2%	3.0%	3.0%	4.1%	−1.1%

**1993 US numbers are latest 5−year average

This scenario combines scenarios 1(a), 1(b), and 2(a).

Scenario 1(a)

This scenario changed the cost of capital for each year from Moody's yield on public utility bonds to the FCC authorized rate of return. Christensen Associates selected Moody's yield on public utility bonds because it is a widely and is easily verified. If the FCC authorized rate of return is used, average annual TFP growth for the LECs becomes lower over the 1984−1992 period.

FOOTNOTE CONTINUED ON NEXT PAGE

FOOTNOTE TO SCENARIO 4(a) – CONTINUED

Scenario 1(b)

The original request for this scenario was to change depreciation rates from the economic rates of replacement to FCC prescribed depreciation rates. This would require depreciation rates from the 1984–1993 period and the pre–1984 period. USTA was unable to provide Christensen Associates with the industry average FCC prescribed rates. Thus, the sensitivity analysis was performed by using the 1993 FCC depreciation rates for every year of the study. Note that changes to the 1984–1993 depreciation rates also involve changes to the economic stock adjustment factor because the stock adjustment factor embodies the depreciation of assets up to 1984. Consistency requires that if 1984–1993 depreciation rates change, the pre–1984 rates must also be changed. Therefore, while we still retain the same approach to computing the stock adjustment factors, their values will change under 1(b)

Scenario 2(a)

This scenario arbitrarily increases the economic stock adjustment factors by 0.1. Christensen Associates used an economic stock adjustment factor to adjust the gross stock for the age distribution of the assets, based on U.S. Bureau of Economic Analysis (BEA) reports. To assist the FCC in determining the sensitivity of this parameter, Christensen Associates also performed an analysis by decreasing the economic stock adjustment factor by 0.1. However, arbitrarily changing the economic stock adjustment factor by +0.1 or –0.1 results in an incorrect TFP number.

5–year rolling averages for TFP are also calculated. The FCC also requested 5–year rolling averages of LEC total input prices and 5–year rolling averages of the rate of growth of U.S. private business sector input prices. The input prices for the LECs are a residual calculation and are not the main focus of the productivity study. The productivity study primarily focuses on quantities of output and input. USTA will file an affidavit by Dr. Laurits R. Christensen explaining why an input price adjustment is inappropriate in the LECs price cap formula.

This table also includes average annual growth rate calculations for the 1984–1992, 1984–1993, and 1985–1993 periods as requested by the FCC staff.

PARAMETER VALUES	QUESTION 4(a)*
COST OF CAPITAL	1(a): FCC ROR
DEPRECIATION	1(b): FCC 93
STOCK ADJUSTMENT	2(a)*: Subtract 0.1

	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1984						
1985	0.6%	0.5%	0.1%	3.9%	4.0%	−0.1%
1986	2.3%	1.0%	1.3%	7.2%	3.8%	3.4%
1987	1.3%	0.1%	1.2%	−0.9%	3.1%	−4.0%
1988	1.7%	0.6%	1.1%	−3.5%	4.4%	−7.9%
1989	1.6%	−0.3%	1.9%	−1.2%	4.1%	−5.3%
1990	4.3%	−0.3%	4.6%	10.1%	4.2%	5.9%
1991	1.0%	−1.1%	2.1%	1.5%	2.9%	−1.4%
1992	3.2%	1.9%	1.3%	5.2%	5.1%	0.1%
*1993	2.5%			−0.7%		
*US numbers not available for 1993						
Avg 84–92	2.0%	0.3%	1.7%	2.8%	4.0%	−1.2%
Avg 84–93	2.0%			2.4%		
Avg 85–93	2.2%			2.2%		

FIVE–YEAR ROLLING AVERAGES

5–year avg ending in	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1989	1.5%	0.4%	1.1%	1.1%	3.9%	−2.8%
1990	2.2%	0.2%	2.0%	2.3%	3.9%	−1.6%
1991	2.0%	−0.2%	2.2%	1.2%	3.7%	−2.6%
1992	2.3%	0.2%	2.2%	2.4%	4.1%	−1.7%
**1993	2.5%	0.2%	2.3%	3.0%	4.1%	−1.2%

**1993 US numbers are latest 5–year average

This scenario combines scenarios 1(a), 1(b), and 2(a)*.

Scenario 1(a)

This scenario changed the cost of capital for each year from Moody's yield on public utility bonds to the FCC authorized rate of return. Christensen Associates selected Moody's yield on public utility bonds because it is a widely and is easily verified. If the FCC authorized rate of return is used, average annual TFP growth for the LECs becomes lower over the 1984–1992 period.

FOOTNOTE CONTINUED ON NEXT PAGE

FOOTNOTE TO SCENARIO 4(a)* – CONTINUED

Scenario 1(b)

The original request for this scenario was to change depreciation rates from the economic rates of replacement to FCC prescribed depreciation rates. This would require depreciation rates from the 1984–1993 period and the pre–1984 period. USTA was unable to provide Christensen Associates with the industry average FCC prescribed rates. Thus, the sensitivity analysis was performed by using the 1993 FCC depreciation rates for every year of the study. Note that changes to the 1984–1993 depreciation rates also involve changes to the economic stock adjustment factor because the stock adjustment factor embodies the depreciation of assets up to 1984. Consistency requires that if 1984–1993 depreciation rates change, the pre–1984 rates must also be changed. Therefore, while we still retain the same approach to computing the stock adjustment factors, their values will change under 1(b)

Scenario 2(a)*

This scenario arbitrarily decreases the economic stock adjustment factors by 0.1. Christensen Associates used an economic stock adjustment factor to adjust the gross stock for the age distribution of the assets, based on U.S. Bureau of Economic Analysis (BEA) reports. To assist the FCC in determining the sensitivity of this parameter, Christensen Associates also performed an analysis by increasing the economic stock adjustment factor by 0.1. However, arbitrarily changing the economic stock adjustment factor by +0.1 or –0.1 results in an incorrect TFP number.

5–year rolling averages for TFP are also calculated. The FCC also requested 5–year rolling averages of LEC total input prices and 5–year rolling averages of the rate of growth of U.S. private business sector input prices. The input prices for the LECs are a residual calculation and are not the main focus of the productivity study. The productivity study primarily focuses on quantities of output and input. USTA will file an affidavit by Dr. Laurits R. Christensen explaining why an input price adjustment is inappropriate in the LECs price cap formula.

This table also includes average annual growth rate calculations for the 1984–1992, 1984–1993, and 1985–1993 periods as requested by the FCC staff.

PARAMETER VALUES	QUESTION 4(b)
COST OF CAPITAL	1(a): FCC ROR
DEPRECIATION	1(b): FCC 93
STOCK ADJUSTMENT	2(b): All=1.0

	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1984						
1985	3.0%	0.5%	2.4%	3.8%	4.0%	−0.2%
1986	4.4%	1.0%	3.3%	8.0%	3.8%	4.2%
1987	3.6%	0.1%	3.5%	−1.3%	3.1%	−4.4%
1988	3.9%	0.6%	3.3%	−3.1%	4.4%	−7.5%
1989	3.5%	−0.3%	3.8%	−1.6%	4.1%	−5.7%
1990	5.4%	−0.3%	5.7%	10.7%	4.2%	6.5%
1991	2.2%	−1.1%	3.4%	1.3%	2.9%	−1.6%
1992	4.1%	1.9%	2.2%	5.7%	5.1%	0.6%
*1993	3.5%			−1.9%		
*US numbers not available for 1993						
Avg 84−92	3.8%	0.3%	3.5%	2.9%	4.0%	−1.0%
Avg 84−93	3.7%			2.4%		
Avg 85−93	3.8%			2.2%		

FIVE−YEAR ROLLING AVERAGES

5−year avg ending in	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1989	3.6%	0.4%	3.3%	1.1%	3.9%	−2.7%
1990	4.1%	0.2%	3.9%	2.5%	3.9%	−1.4%
1991	3.7%	−0.2%	3.9%	1.2%	3.7%	−2.6%
1992	3.8%	0.2%	3.7%	2.6%	4.1%	−1.5%
**1993	3.8%	0.2%	3.6%	2.8%	4.1%	−1.3%

**1993 US numbers are latest 5−year average

This scenario combines scenarios 1(a), 1(b), and 2(b)

Scenario 1(a)

This scenario changed the cost of capital for each year from Moody's yield on public utility bonds to the FCC authorized rate of return. Christensen Associates selected Moody's yield on public utility bonds because it is a widely and is easily verified. If the FCC authorized rate of return is used, average annual TFP growth for the LECs becomes lower over the 1984−1992 period. (FOOTNOTE CONTINUED ON NEXT PAGE)

FOOTNOTE TO SCENARIO 4(b) – CONTINUED

Scenario 1(b)

The original request for this scenario was to change depreciation rates from the economic rates of replacement to FCC prescribed depreciation rates. This would require depreciation rates from the 1984–1993 period and the pre–1984 period. USTA was unable to provide Christensen Associates with the industry average FCC prescribed rates. Thus, the sensitivity analysis was performed by using the 1993 FCC depreciation rates for every year of the study. Note that changes to the 1984–1993 depreciation rates also involve changes to the economic stock adjustment factor because the stock adjustment factor embodies the depreciation of assets up to 1984. Consistency requires that if 1984–1993 depreciation rates change, the pre–1984 rates must also be changed. Therefore, while we still retain the same approach to computing the stock adjustment factors, their values will change under 1(b)

Scenario 2(b)

This scenario arbitrarily changes the economic stock adjustment factor to 1.0. Changing the economic stock adjustment factor assumes that there is no decline in the economic efficiency of an asset over its lifetime (the "light bulb" assumption). This is inconsistent with the capital computations made in our study. Using a value of 1.0 is an incorrect assumption, but Christensen Associates performed the analysis as requested by the FCC staff. Arbitrarily changing the economic stock adjustment factor results in an incorrect TFP number.

5–year rolling averages for TFP are also calculated. The FCC also requested 5–year rolling averages of LEC total input prices and 5–year rolling averages of the rate of growth of U.S. private business sector input prices. The input prices for the LECs are a residual calculation and are not the main focus of the productivity study. The productivity study primarily focuses on quantities of output and input. USTA will file an affidavit by Dr. Laurits R. Christensen explaining why an input price adjustment is inappropriate in the LECs price cap formula.

This table also includes average annual growth rate calculations for the 1984–1992, 1984–1993, and 1985–1993 periods as requested by the FCC staff.

PARAMETER VALUES	QUESTION 4(b)*
COST OF CAPITAL	1(a): FCC ROR
DEPRECIATION	1(b): FCC 93
STOCK ADJUSTMENT	2(b)*: All=0.2

	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1984						
1985	−5.1%	0.5%	−5.6%	1.6%	4.0%	−2.4%
1986	−2.2%	1.0%	−3.2%	4.5%	3.8%	0.7%
1987	−2.7%	0.1%	−2.8%	−1.8%	3.1%	−4.9%
1988	−1.7%	0.6%	−2.3%	−3.0%	4.4%	−7.4%
1989	−1.0%	−0.3%	−0.7%	−1.9%	4.1%	−6.0%
1990	2.7%	−0.3%	3.0%	7.2%	4.2%	3.0%
1991	−0.9%	−1.1%	0.2%	1.9%	2.9%	−1.0%
1992	2.0%	1.9%	0.1%	3.8%	5.1%	−1.3%
*1993	1.0%			−0.0%		
*US numbers not available for 1993						
Avg 84−92	−1.1%	0.3%	−1.4%	1.6%	4.0%	−2.4%
Avg 84−93	−0.9%			1.4%		
Avg 85−93	−0.3%			1.3%		

FIVE−YEAR ROLLING AVERAGES

5−year avg ending in	LEC TFP Growth	BLS US MFP Growth	TFP Growth Differential	LEC Input Price Growth	US Economy Input Price Growth	Input Price Growth Differential
1989	−2.5%	0.4%	−2.9%	−0.1%	3.9%	−4.0%
1990	−1.0%	0.2%	−1.2%	1.0%	3.9%	−2.9%
1991	−0.7%	−0.2%	−0.5%	0.5%	3.7%	−3.2%
1992	0.2%	0.2%	0.1%	1.6%	4.1%	−2.5%
**1993	0.8%	0.2%	0.6%	2.2%	4.1%	−1.9%

**1993 US numbers are latest 5−year average
This scenario combines scenarios 1(a), 1(b), and 2(b)*

Scenario 1(a)
This scenario changed the cost of capital for each year from Moody's yield on public utility bonds to the FCC authorized rate of return. Christensen Associates selected Moody's yield on public utility bonds because it is a widely and is easily verified. If the FCC authorized rate of return is used, average annual TFP growth for the LECs becomes lower over the 1984−1992 period. (FOOTNOTE CONTINUED ON NEXT PAGE)

FOOTNOTE TO SCENARIO 4(b)* – CONTINUED

Scenario 1(b)

The original request for this scenario was to change depreciation rates from the economic rates of replacement to FCC prescribed depreciation rates. This would require depreciation rates from the 1984–1993 period and the pre–1984 period. USTA was unable to provide Christensen Associates with the industry average FCC prescribed rates. Thus, the sensitivity analysis was performed by using the 1993 FCC depreciation rates for every year of the study. Note that changes to the 1984–1993 depreciation rates also involve changes to the economic stock adjustment factor because the stock adjustment factor embodies the depreciation of assets up to 1984. Consistency requires that if 1984–1993 depreciation rates change, the pre–1984 rates must also be changed. Therefore, while we still retain the same approach to computing the stock adjustment factors, their values will change under 1(b)

Scenario 2(b)*

This scenario is a complement to scenario 2(b) and arbitrarily changes the economic stock adjustment factors all to 0.2 (the lowest value possible without obtaining negative capital stocks. As requested by the FCC staff, Christensen Associates performed an analysis by changing the economic stock adjustment factor to 1.0 in scenario 2(b) and changed the factor to 0.2 in this scenario. Arbitrarily changing the economic stock adjustment factor is inconsistent with the 1984–1993 capital computations and results in an incorrect TFP number.

5–year rolling averages for TFP are also calculated. The FCC also requested 5–year rolling averages of LEC total input prices and 5–year rolling averages of the rate of growth of U.S. private business sector input prices. The input prices for the LECs are a residual calculation and are not the main focus of the productivity study. The productivity study primarily focuses on quantities of output and input. USTA will file an affidavit by Dr. Laurits R. Christensen explaining why an input price adjustment is inappropriate in the LECs price cap formula.

This table also includes average annual growth rate calculations for the 1984–1992, 1984–1993, and 1985–1993 periods as requested by the FCC staff.

EX PARTE

United States Telephone Association

1401 H Street, N.W., Suite 600
Washington, D.C. 20005-2136
(202) 326-7300
(202) 326-7333 FAX

February 1, 1995

FEB - 1 1995

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street NW - Room 222
Washington, D.C. 20554

RE: Ex Parte Filing
CC Docket No. 94-1

Dear Mr. Caton:

Attached is an affidavit prepared by Dr. Laurits Christensen of Christensen Associates. This affidavit was commissioned by the United States Telephone Association (USTA) to discuss why an input price adjustment (which has been suggested by some parties to this proceeding) would be an inappropriate addition to the LEC price cap formula being reviewed in this proceeding.

An original and two copies of this ex parte notice and attachment are being filed in the Office of the Secretary on February 1, 1995. Please include this notice and attached material in the public record of these proceedings.

Respectfully Submitted

Frank McKennedy
Director - Policy Analysis

cc: Richard Metzger
Michael Katz
Mark Uretsky
Dr. Anthony Bush
Alexander Belinfante

AN INPUT PRICE ADJUSTMENT WOULD BE AN INAPPROPRIATE ADDITION TO THE LEC PRICE CAP FORMULA:

AFFIDAVIT OF DR. LAURITS R. CHRISTENSEN

ON BEHALF OF THE UNITED STATES TELEPHONE ASSOCIATION

CC DOCKET NO. 94-1

February 1, 1995

AN INPUT PRICE ADJUSTMENT WOULD BE AN INAPPROPRIATE ADDITION TO THE LEC PRICE CAP FORMULA: AFFIDAVIT OF DR. LAURITS R. CHRISTENSEN ON BEHALF OF THE UNITED STATES TELEPHONE ASSOCIATION

CC DOCKET NO. 94-1
January 30, 1995

Introduction

My name is Laurits R. Christensen. I am President of Christensen Associates, an economic consulting firm located at 4610 University Avenue in Madison, Wisconsin. I studied engineering and economics at Cornell University, from which I graduated in 1964. I did my graduate work at the University of California, Berkeley, where I obtained an M.S. in statistics and a Ph.D. in economics. From 1967 to 1987 I was a Professor of Economics at the University of Wisconsin-Madison. Since 1976 I have also been President of Christensen Associates.

The purpose of this affidavit is to discuss issues regarding productivity and input prices as they relate to the LEC price cap formula. In particular, I will rebut the claim by Dr. Lee L. Selwyn that it would be appropriate to add an input price adjustment to the LEC price cap formula.[1] Dr. Selwyn and I both use the term productivity synonymously with the more technical term Total Factor Productivity

[1]Dr. Selwyn's views can be found in the Economics and Technology, Inc., report, "An Empirical Estimate of the LEC Price Cap 'X Factor'," filed as Attachment A to the Reply Comments of The Ad Hoc Telecommunications Users Committee, CC Docket No. 94-1, June 29, 1994.

(TFP). Productivity or TFP refers to the amount of goods and services produced by a firm, an industry, or a national economy, relative to the amount of labor, capital, and other inputs needed to produce the goods and services. The higher is this productivity ratio, the lower is the real cost of production. High productivity in the U.S. economy is the primary basis for the high standard of living that we have achieved in the United States. The term input prices refers to the per unit cost to business firms of acquiring labor services, capital services, and other inputs.

Qualifications

I have specialized in productivity analysis ever since my graduate studies in the mid-1960's, and I have published numerous papers on this subject. These papers include methodological developments, as well as actual measurement of productivity performance for individual firms and industries, and for the entire economies of various countries.

I have extensive experience analyzing productivity for telephone companies. In the late 1970's I performed an in-depth study of productivity performance for AT&T and the Bell System. This study served as the basis for my testimony regarding productivity in the U.S. Department of Justice v. AT&T antitrust case.

In recent years, I have studied productivity issues for AT&T, U S West, BellSouth, NYNEX, Southwestern Bell, and Ameritech. I have filed comments and studies and have testified regarding telephone company productivity and related issues before the Federal Communications Commission, as well as public service

commissions in Arkansas, Colorado, Illinois, Indiana, Iowa, Maine, Massachusetts, North Dakota, Ohio, Washington, and Wisconsin.

My professional experience includes the analysis of input prices. The proper treatment of input prices is an important aspect of the accurate measurement of productivity growth. Many of my professional papers include discussion of input price measurement. For example, my 1969 paper (co-authored with Professor Dale W. Jorgenson of Harvard University) "The Measurement of U.S. Real Capital Input, 1929-1967" discusses the proper measurement of input prices for capital services, and is often cited as a reference for capital input price measurement. I have also filed comments and testified regarding input prices for telephone companies before the FCC and state regulatory commissions in Illinois, Ohio, Maine, Massachusetts, and Washington.

I have been involved in the development of indexes for alternative regulation. The FCC cited my AT&T productivity study as a basis for its choice of the productivity offset in the AT&T price cap plan, and I have testified in North Dakota, Wisconsin, Illinois, Indiana, Ohio, Maine, Massachusetts, and Washington regarding the appropriate treatment of productivity in alternative regulation plans.

I also have experience in the design of alternative regulation plans in other industries. The productivity adjustment mechanism that is used by the Interstate Commerce Commission to set the price cap for railroad freight traffic was proposed by me and my colleague, Dr. Douglas W. Caves. In addition, I am currently

working with electric, gas, and telephone companies in the establishment of indexes to be used in alternative regulation plans.

Conceptual Framework for Price Cap Formula

Dr. Selwyn and I agree that the difference between the trends in Total Factor Productivity for the LECs and the entire U.S. economy is the appropriate concept for specifying the productivity offset in the LEC price cap formula. We disagree, however, on the necessity of adding an input price adjustment to the LEC price cap formula.

In my revised and updated USTA study I found a productivity growth trend for the LECs of 2.4% per year for the 1985-1992 period.[2] The productivity growth trend for the entire U.S. economy during that period is .3% per year, based on the most recent data from the U.S. Bureau of Labor Statistics. The difference is 2.1% per year, which I believe is the proper productivity offset for the LEC price cap formula.

Dr. Selwyn has claimed, without any corroborating data, that in the near future LEC input prices are likely to rise slower than input prices for the entire U.S. economy. This position on input price growth is indefensible, as I demonstrate below. There is no conceptual or empirical basis for presuming that LEC input

[2]On January 16, 1995, I released a revised and updated version of my study, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation" (co-authored with P. E. Schoech and M. E. Meitzen).

prices will increase significantly slower than input prices for the entire U.S. economy.

Input Price Analysis

Telephone companies compete for labor, capital, and other inputs with all other sectors of the U.S. economy. Therefore, one would expect input prices for telephone companies to have the same long-term trend as other sectors of the economy, and hence, the same as the entire U.S. economy. This expectation is validated by long-term historical evidence.

Over the period 1949 to 1992, input prices for U.S. telephone companies grew at virtually the same rate as for the rest of the economy. Exhibit A shows the year-by-year percentage changes in input prices for the U.S. economy and U.S. telephone companies. For the full 44-year period, input price growth averaged 4.8% per year for the U.S. economy and 4.7% per year for telephone companies. The graph shows that, in spite of the pronounced short-term volatility in both series, the long-term patterns are the same.

It is straightforward to conduct a formal statistical test of the hypothesis that the trend in input price growth for the telephone industry equals the trend in input price growth for the entire U.S. economy. I have performed this test and found that there is no evidence that the input price trends differ. Details of the test are presented in Exhibit A. The result holds for the full 1949-1992 period, as well as for the 1949-1984 and 1985-1992 sub-periods. This means that any

observed short-term differences in input price growth cannot be properly construed as representing a difference in the underlying trends of input prices for the LECs and the entire U.S. economy.

Furthermore, neither Dr. Selwyn nor anyone else has provided evidence to support the proposition that LEC input prices will rise slower than U.S. economy input prices in the near future. U.S. economy input price growth reflects changes in prices for labor input and prices for capital input. Current evidence on LEC labor and capital input price trends supports an expectation that they will not differ significantly from their economy-wide counterparts. I will now discuss this evidence.

Over the post-divestiture period the LEC labor input price and the U.S. economy labor input price have shown similar trends. This is shown in Exhibit B. Relative to a normalized labor input price of 1.000 in 1984, the LEC labor input price in 1993 was 1.478 and the U.S. economy labor input price was 1.426. In spite of the similar trends, the rates of growth differed from year to year. This is shown in Exhibit C. In Exhibit D, I present both the relative labor input prices and their rates of growth for each year from 1985 to 1993. The average rate of growth for the LECs was 4.3% per year, and the average rate of growth for the U.S. economy was 3.9% per year.

Since the start of the price cap plan for the LECs in 1991, the LEC labor input price has increased more rapidly than the U.S. economy labor input price in every year: growth in the LEC labor input price has averaged 6.7% per year, while

growth in the labor input price for the U.S. economy has averaged 3.8% per year. Extrapolation of the lines in Exhibit B would suggest that the labor input price for the LECs would rise more rapidly than for the U.S. economy following 1993. But such an extrapolation would be unwarranted, since it is inappropriate to attempt to forecast differential growth when there is no evidence of a difference in the underlying trends.

I will now discuss recent changes in measured capital input prices for the LECs and the entire U.S. economy. The most important factor that drives changes in the price of capital input is the opportunity cost of capital. Most LEC capital goods and U.S. economy capital goods are owned by the firms employing them. The largest annual cost of owning these capital goods is the foregone returns that could be earned by the funds that were used to acquire the capital goods.

For my USTA study of LEC productivity growth, I used Moody's composite yield for public utility bonds as a proxy for the opportunity cost of capital for all LECs.[3] This yield fell from 14.03% in 1984 to 7.56% in 1993. This decline mirrored changes that took place in all market interest rates in the United States. For example the yield on 30-year U.S. Treasury bonds fell from 12.41% in 1984 to 6.59% in 1993. In Exhibit E, I present both the Moody's public utility bond yield

[3]Since the yield on public utility bonds reflects the cost of debt, but not equity, and since the cost of equity is typically higher than the cost of debt, this proxy will tend to understate the full opportunity cost of capital to the LECs. Moreover, since the cost of debt has recently fallen relative to the cost of equity, this proxy has declined relative to the full opportunity cost of capital to the LECs.

and the 30-year Treasury rate for all years from 1984 through 1993. Other market interest rates show similar time patterns.

All sectors of the U.S. economy experienced similar declines in the "carrying costs" for owner-employed capital goods. However, capital input prices for the U.S. economy are not measured the same way that I have measured them for the LECs. Therefore, because they are measured differently, the pattern of measured capital input prices for the LECs and the entire economy differ. Capital input costs for the U.S. economy are measured residually, based on net income, rather than directly based on interest costs--as I have for the LECs. In the 1980's and early 1990's profits in the U.S. economy increased at the same time that interest rates were falling. The measurement of U.S. capital input prices commingles profits with the opportunity cost of capital. In Exhibit F, I present the opportunity cost of capital for the U.S. economy, as it is implicitly measured in the U.S. National Income and Product Accounts. What Exhibit F shows is that the implicit opportunity cost of capital for the U.S. economy does not reflect the dramatic decline in interest rates during the 1985 to 1992 period. In fact, the implicit opportunity cost is actually higher in 1992 than it was in 1984.

Since changes in capital input prices are driven primarily by changes in the opportunity cost of capital, use of the opportunity cost implicit in the U.S. National Income and Product Accounts, gives the erroneous impression that LEC capital input prices declined substantially relative to other firms in the economy. But other firms and sectors actually had the same type of decline in opportunity cost that

was experienced by the LECs. Therefore, a meaningful comparison of capital input price growth for the LECs and the rest of the U.S. economy cannot be made using my USTA productivity study and the U.S. National Income and Product Accounts--because they are measuring two different concepts.

Even though the lines in Exhibit F measure different concepts, on a going-forward basis, they cannot continue to diverge. This follows because interest rates have declined from levels that are extremely high by historical standards to a level that is more in keeping with historical norms. In fact, in 1994 interest rates increased substantially, as manifested by Moody's composite yield on public utility bonds being as high as 9% late in 1994. Therefore, although LEC capital input prices as measured in my USTA productivity study and capital input prices for the entire U.S. economy (as measured in the U.S. National Income and Product Accounts) are not directly comparable, in the near future they are likely to grow at similar rates.

Concluding Remarks

There is no reason to expect telephone company input prices to rise slower than input price growth for other sectors of the U.S. economy. This concept is validated by the fact that the long-term trends are the same. Short-term input price data exhibit substantial volatility, but provide no evidence of divergent trends. From 1985 to 1993 the LEC measured capital input price rose slower than the measured capital input price for the U.S. economy, and the LEC labor input price

rose faster than the labor input price for the U.S. economy. But neither of these differences can be properly construed as a change in long-term trends. Hence, because they cannot be expected to continue, they cannot form the basis for appropriate regulatory policy. In particular the short-term difference in measured capital input prices reflects the fact that measured LEC capital input prices reflect a much larger weight on interest rates than measured U.S. capital input prices, and the fact that up until 1993 the post-divestiture period has been a time of declining interest rates. A rise in interest rates, such as occurred in 1994, will cause a short-term difference in the opposite direction.

Neither Dr. Selwyn, nor anyone else, has provided any evidence in this proceeding that, on a going-forward basis, LEC input price growth will be slower than input price growth for the entire U.S. economy. As I have shown, Dr. Selwyn's claim that my USTA study provides such evidence is simply incorrect, and he has provided no other evidence.

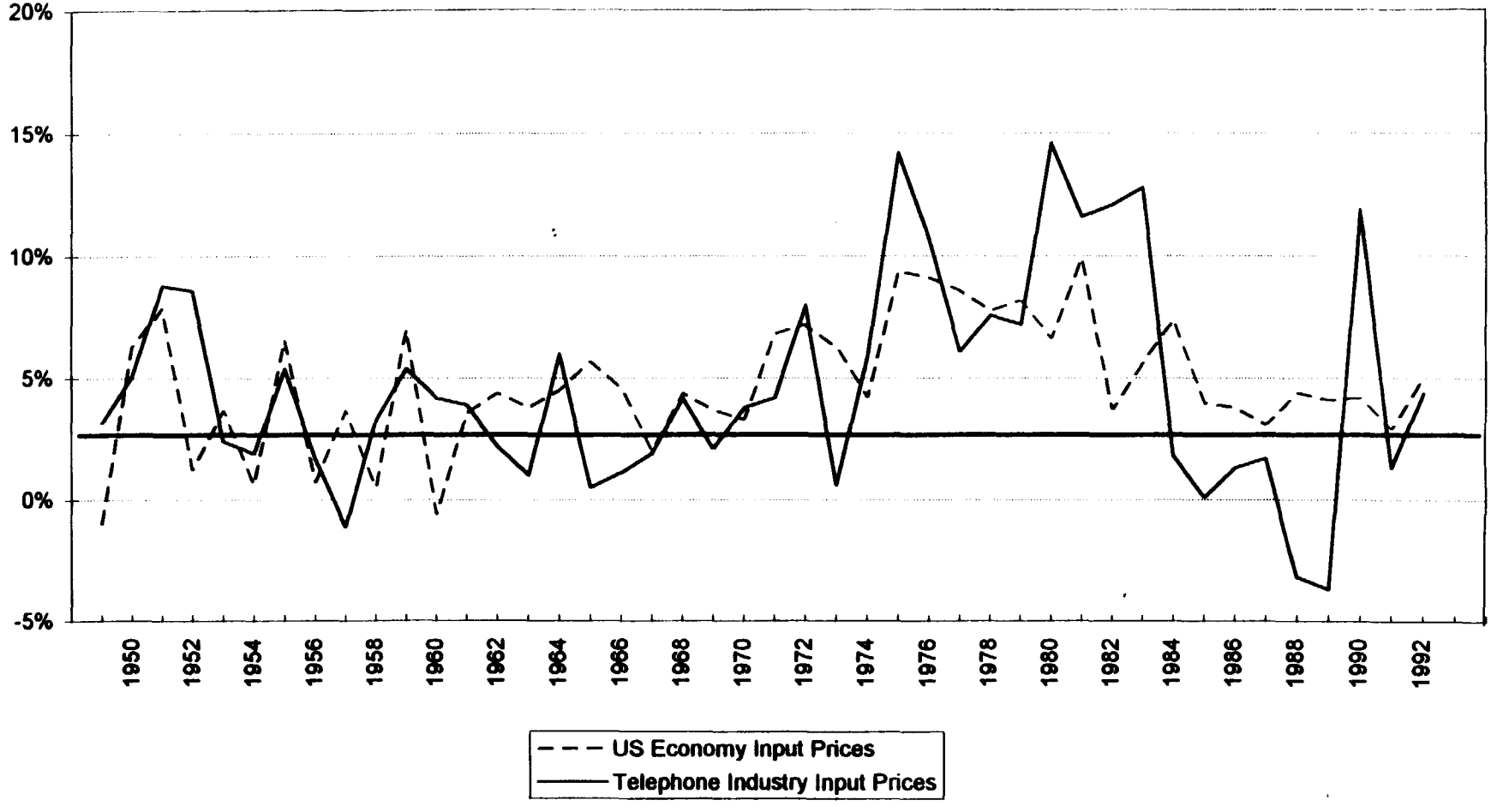
Given that short-term fluctuations in input prices provide no basis for forecasting future changes in input prices, I believe it would be inappropriate for the Commission to include an adjustment in the LEC price cap formula to reflect recent short-term fluctuations in input prices. Such an adjustment would just as likely, indeed probably more likely, be in the wrong direction. This is because short-term differences in one direction tend to be offset by subsequent short-term differences in the other direction, a mechanism that underlies the finding of no difference in the long-term trends of input prices for the LECs and the U.S.

economy. This might well result in a "double-whammy" for the LECs: a downward adjustment in the price cap based on recent data, when actual experience might require an upward adjustment in the price cap to compensate the LECs for faster input price growth than experienced by the rest of the U.S. economy.

Exhibit A

U.S. Economy and Telephone Industry Input Price Growth

Comparison of U.S. Economy Input Price Growth with Telephone Industry Input Price Growth



1948-1992 averages: 4.8% U.S. Economy
4.7% Telephone Industry