Attachment B

Scenario 4: Corrected Model

Scenario 5 combines changes in interstate TS output quantities (Scenario 1), intrastate output quantities (Scenario 2) and removal of the hedonic adjustment (Scenario 3) to arrive at a corrected X-factor calculation within the framework of the Norsworthy model. Results are displayed in Tables 4a and 4b for the time periods 1985-1994 and 1990-1994, respectively.

Table 4a

	Interstate	Intrastate	Total
1985 - 1994			
Output Growth	5.23%	3.31%	3.81%
Input Growth	0.86%	0.86%	0.86%
LEC TFP	4.37%	2.44%	2.94%
US TFP	0.15%	0.15%	0.15%
TFP Diff	4.22%	2.29%	2.79%
Input Price LEC	1.49%	1.49%	1.49%
Input PRICE US	3.00%	3.00%	3.00%
Input Price Diff	1.51%	1.51%	1.51%
TFP Diff + IPD	5.73%	3.80%	4.30%

Table 4b

	Interstate	Intrastate	Total
1990 - 1994			
Output Growth	4.32%	3.73%	3.79%
Input Growth	-0.63%	-0.63%	-0.63%
LEC TFP	4.96%	4.36%	4.43%
US TFP	0.21%	0.21%	0.21%
TFP Diff	4.75%	4.15%	4.22%
Input Price LEC	2.98%	2.98%	2.98%
Input PRICE US	2.12%	2.12%	2.12%
Input Price Diff	-0.86%	-0.86%	-0.86%
TFP Diff + IPD	3.89%	3.29%	3.36%

ATTACHMENT C

Analysis of USTA/Christensen Model

Attachment C

Analysis of USTA Christensen Model

Summary

The major conclusion from the Cronin study is that a direct formula is superior to the "modified" differential approach, (i.e. the approach advocated by Christensen and USTA that uses GDPPI as a measure of economy-wide price inflation, subtracts a TFP differential, but ignores the input price differential). Furthermore, Cronin finds the following specific problems in the Christensen/USTA method: 1) GDPPI is not an accurate measure of economy-wide price changes, 2) GDPPI is not an accurate surrogate for a materials price index, 3) the correct definition of capital cost in measuring productivity is capital consumption, and 4) labor prices should not be influenced by changes in the composition of employment or be unduly influenced by changes in accounting practices. By making corrections to the Christensen study for these problems, we find that the adjusted results coincide with the results found in the Cronin study, validating those findings and producing accurate measures of LEC TFP growth and input price changes.

Adjustments

The objective of this analysis is to make corrections for the flaws in the Christensen/USTA approach in order to calculate accurate measures of LEC TFP and input prices. The following adjustments to the model were made.

1) The capital input component

   a) Apply replacement values as measure of capital input cost for weighting
   b) Substitute FCC prescribed depreciation rates for the rates used by Christensen
   c) Apply BEA asset price indices as measurement of capital input prices

The Christensen study derives capital cost by adding opportunity cost of capital, income taxes, property taxes, capital stock taxes, value of replacement, and subtracting capital gains. The proper definition of the capital input component as demonstrated by Cronin is capital consumption. In order to capture capital consumption, all that is required is a measure of the cost to replace the capital that is consumed. The value of replacement calculated by Christensen meets closely the definition of capital consumption and therefore provides a suitable measure for weighting the capital input component. In addition, the Christensen replacement values were adjusted to reflect FCC prescribed depreciation rates instead of those used by Christensen. The asset price indices which are founded on data from the BEA and used by Christensen serve as an appropriate measure of capital input prices.

2) The labor input component

   a) Adjust labor expenses by reducing the influence of accounting changes

The Christensen study uses booked wages & salaries and benefit expenses to calculate the labor input component. This measure does not provide a reliable basis for labor price changes. Booked labor expenses are influenced by changes in the composition of employees as well as changes in accounting practices. These compositional changes and changes in accounting practices have nothing to do with the price of labor. As demonstrated by Cronin, a fixed weight measure, such as the BLS Employment Cost Index, is designed to be free from the influence of employment shifts among occupations and therefore provides a reliable measure of changes in labor prices. SFAS 106 (OPEBS) has had a significant impact on booked labor expenses. As evidence, benefits as a percent of wages & salaries for the LECs increased

from 24% prior to 1991 to 29% in 1991-1992 to over 37% in 1993-1994. Again, accounting changes should have no bearing on a valid measure of labor price changes. As a way to reduce the influence of accounting changes,
labor expenses were adjusted in the model to reflect the pre-1991 percent of benefits. While this adjustment does not remove the influence of compositional changes, it does remove the influence of OPEB related accounting changes and moves the input price series more in line with the BLS labor cost measures used by Cronin.

3) The materials input component

a) Replace GDPPI with the telco specific materials price series from the Cronin study

The Christensen study uses GDPPI as a surrogate for LEC materials input price changes. As demonstrated by Cronin, GDPPI is not an accurate surrogate for this purpose.

4) Common Line output

a) Use line growth in place of minute growth for Carrier Common Line output

Christensen uses line growth for interstate end user common line and minutes for interstate carrier common line. Consistent with the proposed per line cap for common line, the appropriate quantity measurement for ALL common line output is line growth.

Results

Christensen 1989-1994

	Unadjusted	Adjusted	Cronin
Weight			
Capital	50.85%	26.46%	22.29%
Labor	25.83%	37.76%	40.71%
Materials	23.32%	35.78%	36.99%
Input Price Change			
Capital	2.95%	0.92%	1.40%
Labor	7.03%	4.53%	3.71%
Materials	3.43%	1.84%	1.91%
Total	4.11%	2.61%	2.51%

Attachment C
Baseline - Christensen Unadjusted

Input	1988	1989	1990	1991	1992	1993	1994
Cost							
Capital	43,041,036,285	40,893,132,333	43,129,828,736	44,919,636,862	49,042,001,677	51,999,676,231	53,677,635,141
Labor	22,511,293,000	22,603,070,000	22,930,727,000	23,553,774,000	23,771,955,000	25,336,928,000	25,627,805,000
Materials	18,018,313,000	20,036,512,000	20,637,470,000	22,006,899,000	21,266,418,000	22,000,434,000	24,265,611,000
Total	83,570,642,285	83,532,714,333	86,698,025,736	90,480,309,862	94,080,374,677	99,337,038,231	103,571,051,141
Weight							
Capital	N/A	50.23%	49.35%	49.70%	50.89%	52.24%	52.09%
Labor	N/A	27.00%	26.75%	26.24%	25.65%	25.39%	25.13%
Materials	N/A	22.77%	23.90%	24.06%	23.46%	22.38%	22.79%
Quantity							
Capital	43,041,036,285	44,689,675,165	45,802,777,009	47,122,529,624	48,274,351,796	49,494,537,132	50,613,859,470
Labor	604,135	594,772	576,548	549,139	524,353	501,908	474,588
Materials	173,336,344	184,455,807	181,747,864	186,301,790	174,493,686	175,302,263	188,214,939
Quantity Change							
Capital	N/A	3.83%	2.49%	2.88%	2.44%	2.53%	2.26%
Labor	N/A	-1.56%	-3.11%	-4.87%	-4.62%	-4.37%	-5.60%
Materials	N/A	6.22%	-1.48%	2.47%	-6.55%	0.46%	7.11%
Price							
Capital	1.000	0.915	0.942	0.953	1.016	1.051	1.061
Labor	37,262	38,003	39,772	42,892	45,336	50,481	54,000
Materials	103.950	108.625	113.550	118.125	121.875	125.500	128.925
Price Change							
Capital	N/A	-8.88%	2.87%	1.23%	6.37%	3.36%	0.94%
Labor	N/A	1.97%	4.55%	7.55%	5.54%	10.75%	6.74%
Materials	N/A	4.40%	4.43%	3.95%	3.13%	2.93%	2.69%
Aggregate Input							
Quantity Change		2.92%	0.04%	0.75%	-1.48%	0.31%	1.39%
Price Change		-2.93%	3.69%	3.54%	5.39%	5.14%	2.80%

Attachment C

Baseline - Christensen Unadjusted

Output	1988	1989	1990	1991	1992	1993	1994
Revenue							
Local	33,815,096,000	34,663,999,000	35,810,228,000	37,420,078,000	39,003,982,000	40,697,565,000	42,081,863,000
Intrastate Access	6,003,665,000	6,083,891,000	6,218,875,000	6,364,990,000	6,492,571,000	6,739,888,000	6,885,974,000
Toll	13,447,717,000	13,620,071,000	13,550,232,000	12,985,462,000	12,532,277,000	12,627,086,000	12,309,893,000
Interstate End User	4,260,916,000	5,234,789,000	5,568,965,000	5,759,898,000	5,919,313,000	6,263,956,000	6,641,589,000
Interstate Switched	12,090,404,000	11,415,189,000	10,843,689,000	10,772,567,000	10,946,149,000	11,200,613,000	11,636,002,000
Interstate Special	2,829,746,000	2,537,732,000	2,507,064,000	2,417,913,000	2,468,341,000	2,408,596,000	2,532,469,000
Miscellaneous	7,961,596,000	8,449,620,000	8,591,238,000	8,975,543,000	8,494,943,000	8,934,023,000	9,198,820,000
Total	80,409,140,000	82,005,291,000	83,090,091,000	84,696,451,000	85,857,576,000	88,871,707,000	91,286,400,000
Weight							
Local	42.05%	42.27%	43.10%	44.18%	45.43%	45.79%	46.10%
Intrastate Access	7.47%	7.42%	7.48%	7.52%	7.56%	7.58%	7.54%
Toll	16.72%	16.61%	16.31%	15.33%	14.60%	14.21%	13.48%
Interstate End User	5.30%	6.38%	6.70%	6.80%	6.89%	7.05%	7.28%
Interstate Switched	15.04%	13.92%	13.05%	12.72%	12.75%	12.60%	12.75%
Interstate Special	3.52%	3.09%	3.02%	2.85%	2.87%	2.71%	2.77%
Miscellaneous	9.90%	10.30%	10.34%	10.60%	9.89%	10.05%	10.08%
Quantity							
Local	33,815,096,000	35,684,577,929	37,818,384,201	39,331,593,441	41,078,443,391	42,907,290,459	44,796,522,248
Intrastate Access	6,003,665,000	6,105,259,408	6,334,598,146	6,761,914,374	7,003,096,753	7,472,988,136	7,983,737,971
Toll	13,447,717,000	13,795,270,941	13,972,192,205	13,765,993,851	13,468,325,631	13,726,563,757	13,542,016,502
Interstate End User	4,260,916,000	4,429,504,992	4,534,987,785	4,689,706,888	4,780,965,189	4,931,083,996	5,072,625,831
Interstate Switched	12,090,404,000	13,501,110,585	14,561,150,799	15,314,994,313	16,320,484,568	17,274,233,498	18,701,385,407
Interstate Special	2,829,746,000	2,747,355,202	2,743,258,562	2,578,557,108	2,642,197,602	2,749,852,723	3,060,015,708
Miscellaneous	7,961,596,000	8,085,760,766	7,864,553,277	7,898,225,097	7,245,771,921	7,400,002,485	7,416,608,885
Quantity Change							
Local		5.38%	5.81%	3.92%	4.35%	4.36%	4.31%
Intrastate Access		1.68%	3.69%	6.53%	3.50%	6.49%	6.61%
Toll		2.55%	1.27%	-1.49%	-2.19%	1.90%	-1.35%
Interstate End User		3.88%	2.35%	3.3[illegible]%	1.93%	3.09%	2.83%
Interstate Switched		11.04%	7.56%	5.05%	6.36%	5.68%	7.94%
Interstate Special		-2.95%	-0.15%	-6.19%	2.44%	3.99%	10.69%
Miscellaneous		1.55%	-2.77%	0.43%	-8.62%	2.11%	0.22%
Price							
Local	1.0000	0.9714	0.9469	0.9514	0.9495	0.9485	0.9394
Intrastate Access	1.0000	0.9965	0.9817	0.9413	0.9271	0.9019	0.8625
Toll	1.0000	0.9873	0.9698	0.9433	0.9305	0.9199	0.9090
Interstate End User	1.0000	1.1818	1.2280	1.2282	1.2381	1.2703	1.3093
Interstate Switched	1.0000	0.8455	0.7447	0.7034	0.6707	0.6484	0.6222
Interstate Special	1.0000	0.9237	0.9139	0.9377	0.9342	0.8759	0.8276
Miscellaneous	1.0000	1.0450	1.0924	1.1364	1.1724	1.2073	1.2403
Price Change							
Local		-2.90%	-2.55%	0.47%	-0.20%	-0.11%	-0.96%
Intrastate Access		-0.35%	-1.50%	-4.20%	-1.52%	-2.76%	-4.47%
Toll		-1.28%	-1.79%	-2.77%	-1.37%	-1.15%	-1.19%
Interstate End User		16.70%	3.83%	0.02%	0.80%	2.57%	3.02%
Interstate Switched		-16.78%	-12.69%	-5.71%	-4.76%	-3.38%	-4.12%
Interstate Special		-7.94%	-1.07%	2.57%	-0.37%	-6.44%	-5.67%
Miscellaneous		4.40%	4.44%	3.95%	3.12%	2.93%	2.70%
Aggregate Output							
Quantity Change		4.67%	3.84%	2.73%	2.08%	4.01%	3.84%
Price Change		-2.53%	-2.48%	-0.76%	-0.66%	-0.54%	-1.13%

Attachment C
Baseline - Christensen Unadjusted

Summary Results	1989	1990	1991	1992	1993	1994
Direct Approach						
LEC Input Inflation	-2.93%	3.69%	3.54%	5.39%	5.14%	2.80%
LEC TFP	1.76%	3.80%	1.99%	3.56%	3.70%	2.45%
PCI Change = Inp Infl - TFP	-4.68%	-0.11%	1.56%	1.84%	1.44%	0.35%

Attachment C
Adjustments to Christensen Baseline

	1988	1989	1990	1991	1992	1993	1994	
1) Capital								
Incorporate "consumption" definition of capital inputs								
Method: Applied Christensen replacement values (adjusted for FCC depr rates) for capital cost, and Christensen Asset Price Index for capital price series								
								Depreciation Rate
Christensen Value of Replacement	10,701,977,377	11,518,386,759	11,942,297,471	12,366,729,643	12,688,206,254	13,080,950,807	13,536,697,690	
General Support Equipment	1,205,844,395	1,331,427,561	1,395,687,166	1,429,915,403	1,439,180,578	1,440,761,585	1,468,688,914	15.48%
Communications Equipment	6,806,010,910	7,179,277,981	7,386,827,995	7,660,053,865	7,891,018,350	8,171,216,562	8,414,835,412	11.00%
Structures	2,688,122,071	3,007,661,217	3,159,782,310	3,276,760,375	3,358,007,327	3,468,972,679	3,653,173,364	2.25%
Adjusted Value of Replacement	13,930,031,344	15,005,890,865	15,455,282,274	15,853,096,268	16,106,915,168	16,463,716,580	16,959,361,419	
General Support Equipment	1,169,965,455	1,297,101,084	1,364,176,218	1,401,299,818	1,413,532,880	1,417,527,288	1,447,207,398	15.00%
Communications Equipment	6,189,100,827	6,589,315,169	6,838,440,597	7,144,455,618	7,409,119,724	7,716,623,400	7,987,303,881	10.00%
Structures	6,570,965,062	7,119,474,612	7,252,665,459	7,307,340,830	7,284,262,564	7,329,565,904	7,524,850,140	5.50%
Asset Price Index								
General Support Equipment	1.000	0.983	0.943	0.891	0.840	0.784	0.754	
Communications Equipment	1.000	1.013	1.025	1.041	1.055	1.072	1.084	
Structures	1.000	1.089	1.119	1.129	1.129	1.139	1.174	
Weighted Asset Price Index	1.000	1.047	1.062	1.068	1.070	1.077	1.096	
% change in asset prices (input price)		4.55%	1.45%	0.60%	0.12%	0.70%	1.75%	

2) Labor							
Reduce the influence of benefits accounting changes							
Method: Applied average 1988-1990 benefits % of wages&salaries to 1991-1994 expenses							
Christensen wages & salaries	18,214,136,000	18,215,072,000	18,462,119,000	18,325,683,000	18,303,688,000	18,497,395,000	18,249,299,000
Christensen benefits	4,297,157,000	4,387,998,000	4,468,608,000	5,228,091,000	5,468,267,000	6,839,533,000	7,378,506,000
benefits % of wages & salaries	23.59%	24.09%	24.20%	28.53%	29.88%	36.98%	40.43%
adjusted benefits	4,297,157,000	4,387,998,000	4,468,608,000	4,391,234,172	4,385,963,690	4,432,380,121	4,372,930,897
adj benefits % of salaries & wages	23.59%	24.09%	24.20%	23.96%	23.96%	23.96%	23.96%
adjusted total compensation	22,511,293,000	22,603,070,000	22,930,727,000	22,716,917,172	22,689,651,690	22,929,775,121	22,622,229,897

3) Material							
Incorporate telco specific material's price index							
Method: Replaced Christensen's use of GDPPI with Cronin's telecommunication's specific material price index							
GDPPI	103.95	108.625	113.55	118.125	121.875	125.5	128.925
% change in GDPPI		4.40%	4.43%	3.95%	3.13%	2.93%	2.69%
% change in telco materials prices		1.00%	2.93%	0.96%	1.89%	1.85%	1.58%

Attachment C
Christensen Adjusted

Input	1988	1989	1990	1991	1992	1993	1994
Cost							
Capital	13,930,031,344	15,005,890,865	15,455,282,274	15,853,096,266	16,106,915,168	16,463,716,590	16,959,361,419
Labor	22,511,293,000	22,603,070,000	22,930,727,000	22,716,917,172	22,689,651,690	22,929,775,121	22,622,229,897
Materials	18,018,313,000	20,036,512,000	20,637,470,000	22,006,899,000	21,266,418,000	22,000,434,000	24,265,611,000
Total	54,459,637,344	57,645,472,865	59,023,479,274	60,576,912,438	60,062,984,858	61,393,925,711	63,847,202,316
Weight							
Capital	N/A	25.80%	26.11%	26.18%	26.49%	26.82%	26.69%
Labor	N/A	40.27%	39.03%	38.18%	37.64%	37.56%	36.39%
Materials	N/A	33.92%	34.86%	35.65%	35.87%	35.62%	36.92%
Quantity							
Capital	13,930,031,344	14,338,860,948	14,555,229,623	14,840,197,700	15,059,490,100	15,286,221,426	15,473,436,897
Labor	604,135	594,772	576,548	549,139	524,353	501,908	474,588
Materials	18,018,313,000	19,838,130,693	19,843,721,154	20,958,951,429	19,875,157,009	20,183,884,404	21,913,555,990
Quantity Change							
Capital	N/A	2.93%	1.51%	1.96%	1.48%	1.51%	1.22%
Labor	N/A	-1.56%	-3.11%	-4.87%	-4.62%	-4.37%	-5.60%
Materials	N/A	9.62%	0.03%	5.47%	-5.31%	1.54%	8.22%
Price							
Capital	1.000	1.047	1.062	1.068	1.070	1.077	1.096
Labor	37,262	38,003	39,772	41,368	43,272	45,685	47,667
Materials	1.000	1.010	1.040	1.050	1.070	1.090	1.107
Price Change							
Capital	N/A	4.55%	1.45%	0.60%	0.12%	0.70%	1.75%
Labor	N/A	1.97%	4.55%	3.93%	4.50%	5.43%	4.25%
Materials	N/A	1.00%	2.93%	0.96%	1.89%	1.85%	1.58%
Aggregate Input							
Quantity Change		3.39%	-0.81%	0.60%	-3.25%	-0.69%	1.33%
Price Change		2.30%	3.18%	2.00%	2.40%	2.89%	2.59%

Attachment C
Christensen Adjusted

Output	1988	1989	1990	1991	1992	1993	1994
Revenue							
Local	33,815,096,000	34,663,999,000	35,810,228,000	37,420,078,000	39,003,982,000	40,697,565,000	42,081,853,000
Intrastate Access	6,003,665,000	6,083,891,000	6,218,675,000	6,364,990,000	6,492,571,000	6,739,888,000	6,885,974,000
Toll	13,447,717,000	13,620,071,000	13,550,232,000	12,985,462,000	12,532,277,000	12,627,066,000	12,309,693,000
Miscellaneous	7,961,596,000	8,449,620,000	8,591,238,000	8,975,543,000	8,494,943,000	8,934,023,000	9,198,820,000
Total State	61,228,074,000	62,817,581,000	64,170,373,000	65,746,073,000	66,523,773,000	68,998,542,000	70,476,340,000
Interstate Common Line	8,834,763,533	8,718,170,000	8,579,912,000	8,446,488,000	8,492,271,000	9,238,686,000	10,069,332,000
Interstate Switched	7,516,556,467	7,931,808,000	7,832,742,000	8,085,977,000	8,373,191,000	8,225,883,000	8,208,259,000
Interstate Special	2,829,746,000	2,537,732,000	2,507,064,000	2,417,913,000	2,468,341,000	2,408,596,000	2,532,469,000
Total Interstate	19,181,066,000	19,187,710,000	18,919,718,000	18,950,378,000	19,333,803,000	19,873,165,000	20,810,060,000
Total State & Interstate	80,409,140,000	82,005,291,000	83,090,091,000	84,696,451,000	85,857,576,000	88,871,707,000	91,286,400,000
Weight							
Local	55.23%	55.18%	55.80%	56.92%	58.63%	58.98%	59.71%
Intrastate Access	9.81%	9.69%	9.69%	9.68%	9.76%	9.77%	9.77%
Toll	21.96%	21.68%	21.12%	19.75%	18.84%	18.30%	17.47%
Miscellaneous	13.00%	13.45%	13.39%	13.65%	12.77%	12.95%	13.05%
Interstate Common Line	46.06%	45.44%	45.35%	44.57%	43.92%	46.49%	48.39%
Interstate Switched	39.19%	41.34%	41.40%	42.67%	43.31%	41.39%	39.44%
Interstate Special	14.75%	13.23%	13.25%	12.76%	12.77%	12.12%	12.17%
Total State	76.15%	76.60%	77.23%	77.63%	77.48%	77.64%	77.20%
Total Interstate	23.85%	23.40%	22.77%	22.37%	22.52%	22.36%	22.80%
Quantity							
Local	33,815,096,000	35,684,577,929	37,818,384,201	39,331,593,441	41,078,443,391	42,907,290,459	44,796,522,248
Intrastate Access	6,003,665,000	6,105,259,408	6,334,598,146	6,761,914,374	7,003,096,753	7,472,988,136	7,983,737,971
Toll	13,447,717,000	13,795,270,941	13,972,192,205	13,765,993,851	13,468,325,631	13,726,563,757	13,542,016,502
Miscellaneous	7,961,596,000	8,085,760,766	7,864,553,277	7,898,225,097	7,245,771,921	7,400,002,485	7,416,608,885
Total State	61,228,074,000	63,670,869,043	65,989,727,829	67,757,726,763	68,795,637,697	71,506,844,837	73,738,885,606
Interstate Common Line	116,367,890	120,968,239	123,850,902	128,073,888	130,575,917	134,674,007	138,532,479
Interstate Switched	12,090,404,000	13,501,110,585	14,561,150,799	15,314,994,313	16,320,484,568	17,274,233,498	18,701,385,407
Interstate Special	2,829,746,000	2,747,355,202	2,743,258,562	2,578,557,108	2,642,197,602	2,749,852,723	3,060,015,708
Total Interstate	15,036,517,890	16,369,434,026	17,428,260,263	18,021,625,309	19,093,258,088	20,158,760,228	21,899,933,594
Quantity Change							
Local		5.38%	5.81%	3.92%	4.35%	4.36%	4.31%
Intrastate Access		1.68%	3.69%	6.53%	3.50%	6.49%	6.61%
Toll		2.55%	1.27%	-1.49%	-2.19%	1.90%	-1.35%
Miscellaneous		1.55%	-2.77%	0.43%	-8.62%	2.11%	0.22%
Total State		3.89%	3.50%	2.63%	1.38%	3.82%	3.01%
Interstate Common Line		3.88%	2.36%	3.35%	1.93%	3.09%	2.82%
Interstate Switched		11.04%	7.56%	5.05%	6.36%	5.68%	7.94%
Interstate Special		-2.95%	-0.15%	-6.19%	2.44%	3.99%	10.69%
Total Interstate		5.93%	4.18%	2.86%	3.92%	4.27%	5.80%
Total State & Interstate		4.37%	3.65%	2.68%	1.95%	3.92%	3.65%

Attachment C
Christensen Adjusted

Summary Results	1989	1990	1991	1992	1993	1994
Direct Approach						
LEC Input Inflation	2.30%	3.18%	2.00%	2.40%	2.89%	2.59%
LEC TFP	0.98%	4.46%	2.08%	5.20%	4.61%	2.32%
PCI Change = Inp Infl - TFP	1.33%	-1.29%	-0.08%	-2.80%	-1.73%	0.27%

ATTACHMENT D

Comparison of Study Results

Attachment D

Comparison of Study Results

Unadjusted Output Growth

	Interstate	*State Toll*	*Local*	*State Total*	*Total Co*
Norsworthy					
1985	7.54%	11.18%	1.80%	4.91%	6.50%
1986	6.78%	3.67%	1.20%	2.00%	3.27%
1987	7.38%	5.33%	0.65%	2.16%	3.55%
1988	8.81%	6.38%	4.61%	5.20%	6.15%
1989	8.83%	8.29%	3.54%	5.13%	6.10%
1990	8.02%	9.92%	3.63%	5.70%	6.30%
1991	5.47%	6.98%	3.11%	4.35%	4.63%
1992	4.88%	3.36%	3.41%	3.39%	3.76%
1993	5.26%	8.09%	3.11%	4.59%	4.75%
1994	6.05%	8.96%	4.06%	5.48%	5.63%

Adjusted Output Growth

	Interstate	*State Toll*	*Local*	*State Total*	*Total Co*
Norsworthy					
1985	6.05%	5.28%	1.80%	2.95%	5.02%
1986	5.43%	2.40%	1.20%	1.59%	2.61%
1987	5.87%	3.07%	0.65%	1.43%	2.61%
1988	5.96%	3.54%	4.61%	4.26%	4.70%
1989	6.54%	4.42%	3.54%	3.84%	4.54%
1990	5.98%	5.28%	3.63%	4.17%	4.63%
1991	4.76%	3.98%	3.11%	3.39%	3.73%
1992	3.63%	2.58%	3.41%	3.16%	3.27%
1993	4.30%	4.30%	3.11%	3.46%	3.67%
1994	4.61%	5.47%	4.06%	4.47%	4.50%

Attachment D

Comparison of Study Results

Unadjusted Input Price Changes

	Labor	*Capital*	*Materials*	*Aggregate*
Norsworthy				
1985	0.50%	38.64%	4.11%	13.44%
1986	2.47%	10.60%	2.06%	5.38%
1987	1.08%	-2.77%	1.42%	-0.32%
1988	2.66%	-22.57%	2.25%	-6.54%
1989	0.61%	-2.76%	3.67%	0.72%
1990	7.87%	-28.04%	4.00%	-4.15%
1991	4.84%	-5.77%	2.24%	1.00%
1992	0.62%	2.51%	2.07%	1.78%
1993	8.56%	11.14%	1.00%	5.80%
1994	3.00%	-4.98%	2.34%	0.49%

	Labor	*Capital*	*Materials*	*Aggregate*
Christensen				
1989	1.97%	-8.80%	4.40%	-2.93%
1990	4.55%	2.87%	4.43%	3.69%
1991	7.55%	1.23%	3.95%	3.54%
1992	5.54%	6.37%	3.13%	5.39%
1993	10.75%	3.36%	2.93%	5.14%
1994	6.74%	0.94%	2.69%	2.80%

	Labor	*Capital*	*Materials*	*Aggregate*
Cronin				
1986	3.34%	2.06%	-0.99%	2.04%
1987	2.70%	2.02%	-1.00%	1.01%
1988	3.04%	1.98%	0.00%	1.98%
1989	3.25%	1.94%	1.00%	1.94%
1990	3.25%	0.96%	2.93%	2.84%
1991	4.17%	1.89%	0.96%	1.85%
1992	3.83%	0.93%	1.89%	2.72%

1993	3.60%	1.83%	1.85%	2.64%

Attachment D

Comparison of Study Results

Adjusted Input Price Changes

	Labor	*Capital*	*Materials*	*Aggregate*
Norsworthy				
1985	0.50%	39.86%	4.11%	13.82%
1986	2.47%	13.22%	2.06%	6.36%
1987	1.08%	1.42%	1.42%	1.32%
1988	2.66%	-18.01%	2.25%	-4.89%
1989	0.61%	1.12%	3.67%	1.98%
1990	7.87%	-24.99%	4.00%	-3.26%
1991	4.84%	-2.67%	2.24%	1.77%
1992	0.62%	5.62%	2.07%	2.55%
1993	8.56%	14.23%	1.00%	6.64%
1994	3.00%	-3.31%	2.34%	0.95%

	Labor	*Capital*	*Materials*	*Aggregate*
Christensen				
1989	1.97%	4.55%	1.00%	2.30%
1990	4.55%	1.45%	2.93%	3.18%
1991	3.93%	0.60%	0.96%	2.00%
1992	4.50%	0.12%	1.89%	2.40%
1993	5.43%	0.70%	1.85%	2.89%
1994	4.25%	1.75%	1.58%	2.59%

Attachment D

Comparison of Study Results

Unadjusted TFP Growth

	Output	*Input*	*TFP*
Norsworthy			
1985	6.50%	-5.89%	12.39%
1986	3.27%	0.42%	2.85%
1987	3.55%	2.15%	1.40%
1988	6.15%	8.80%	-2.65%
1989	6.10%	0.20%	5.90%
1990	6.30%	5.15%	1.15%
1991	4.63%	0.37%	4.26%
1992	3.76%	0.31%	3.45%
1993	4.75%	-2.56%	7.31%
1994	5.63%	2.19%	3.44%

	Output	*Input*	*TFP*
Christensen			
1989	4.67%	2.92%	1.75%
1990	3.84%	0.04%	3.80%
1991	2.73%	0.75%	1.98%
1992	2.08%	-1.48%	3.56%
1993	4.01%	0.31%	3.70%
1994	3.84%	1.39%	2.45%

Attachment D

Comparison of Study Results

Adjusted TFP Growth

	Output	*Input*	*TFP*
Norsworthy			
1985	5.02%	-6.27%	11.29%
1986	2.61%	-0.56%	3.17%
1987	2.61%	0.50%	2.11%
1988	4.70%	7.16%	-2.46%
1989	4.54%	-1.05%	5.59%
1990	4.63%	4.26%	0.37%
1991	3.73%	-0.40%	4.13%
1992	3.27%	-0.46%	3.73%
1993	3.67%	-3.40%	7.07%
1994	4.50%	1.73%	2.77%

	Output	*Input*	*TFP*
Christensen			
1989	4.37%	3.39%	0.98%
1990	3.65%	-0.81%	4.46%
1991	2.68%	0.60%	2.08%
1992	1.95%	-3.25%	5.20%
1993	3.92%	-0.69%	4.61%
1994	3.65%	1.33%	2.32%

Attachment D

Comparison of Study Results

Direct Approach - Unadjusted

	IP	*TFP*	*PCI*
Norsworthy			
1985	13.44%	12.39%	1.05%
1986	5.38%	2.85%	2.53%
1987	-0.32%	1.40%	-1.72%
1988	-6.54%	-2.65%	-3.89%
1989	0.72%	5.90%	-5.18%
1990	-4.15%	1.15%	-5.30%
1991	1.00%	4.26%	-3.26%
1992	1.78%	3.45%	-1.67%
1993	5.80%	7.31%	-1.51%
1994	0.49%	3.44%	-2.95%

	IP	*TFP*	*PCI*
Christensen			
1989	-2.93%	1.75%	-4.68%
1990	3.69%	3.80%	-0.11%
1991	3.54%	1.98%	1.56%
1992	5.39%	3.56%	1.83%
1993	5.14%	3.70%	1.44%
1994	2.80%	2.45%	0.35%

Attachment D

Comparison of Study Results

Direct Approach - Adjusted

	IP	*TFP*	*PCI*
Norsworthy			
1985	13.82%	11.29%	2.53%
1986	6.36%	3.17%	3.19%
1987	1.32%	2.11%	-0.79%
1988	-4.89%	-2.46%	-2.43%
1989	1.98%	5.59%	-3.61%
1990	-3.26%	0.37%	-3.63%
1991	1.77%	4.13%	-2.36%
1992	2.55%	3.73%	-1.18%
1993	6.64%	7.07%	-0.43%
1994	0.95%	2.77%	-1.82%

	IP	*TFP*	*PCI*
Christensen			
1989	2.30%	0.98%	1.32%
1990	3.18%	4.46%	-1.28%
1991	2.00%	2.08%	-0.08%
1992	2.40%	5.20%	-2.80%
1993	2.89%	4.61%	-1.72%
1994	2.59%	2.32%	0.27%

Attachment E

Investment Categories by Cost Drivers

The following analysis disaggregates investment into three categories based on 1994 ARMIS data for the RBOCs. The three categories are: (1) Investment that is traffic sensitive; (2) Investment that is a function of customer access; and (3) Investment that is fixed, and is not a function of either usage levels or number of customers. COE category 3 Local Switching Equipment has been further broken down based on an incremental cost analysis of a broad sample of Sprint LEC offices to represent the proportions of the local switch that are truly fixed (i.e. getting started costs), customer specific (i.e. line equipment), and usage sensitive.

	Source	Gross Plant	% of Total
Fixed			
General Support Facilities	4304, ln 1004, col b	31,142,179	14.9%
COE - Loc Sw Equip (Cat3) - Fixed	4304, ln 1219, colb * 24.44%	8,699,517	4.2%
Total Other	4304, ln 2240, col b	5,755,336	2.7%
**** Total Fixed**		**45,597,032**	**21.8%**
Customer Specific			
COE - Loc Sw Equip (Cat 3) - Line	4304,ln 1219, col b * 43.00%	15,306,024	7.3%
COE Exchange Ckt Equip (Cat 4.1)	4304, ln 1300, col b	29,798,601	14.2%
COE - Host/Remote (cat 4.3)	4304,ln 1394, col b	835,787	0.4%
IOT - Total	4304, ln 1440, col b	3,620,598	1.7%
CWF - Exchange Line (Cat 1)	4304, ln 1460, col b	79,805,402	38.1%
CWF - Wideband Exch Trunk (Cat 2)	4304,ln 1485, col b	5,834,004	2.8%
CWF - Host/Remote	4304, ln 1524, col b	614,621	0.3%
**** Total Customer Specific**		**135,815,037**	**64.8%**
Traffic Sensitive			
COE - Operator Systems Equip (Cat 1)	4304, ln 1170, col b	917,221	0.4%
COE - Tandem Switching Equip (Cat 2)	4304, ln 1204, col b	3,366,292	1.6%
COE - Loc Sw Equip (Cat 3) - Usage	4304, ln 1219, col b * 32.56%	11,589,864	5.5%
COE - IX Ckt Equip (Cat 4.2)	4304, ln 1380, col b	8,509,218	4.1%
CWF - IX (Cat 3)	4304, ln 1510, col b	3,569,686	1.7%
**** Total Traffic Sensitive**		**27,952,281**	**13.4%**
**** Total Tel Plant**		**209,364,350**	**100.0%**

Attachment F

Impact of the Per Line Cap

	Industry	
1) Line Growth	2.9%	Average annual growth 1989-1994
2) MOU Growth	8.3%	Average annual growth 1989-1994
3) g/2 rate decrease	2.6%	(((1+MOU growth) / (1+Line Growth))-1)/2
4) per line cap rate decrease	5.0%	1-((1+Line Growth)/(1+MOU growth))
5) CCL Rev Growth g/2	5.5%	((1+MOU Growth) * (1-rate decrease))-1
6) CCL Rev Growth per line cap	2.9%	((1+MOU Growth) * (1-rate decrease))-1
7) CCL % of total Access Rev	17.6%	1994 CCL Rev / Tot Access Rev
8) Total Rev Effect of per line vs g/2	0.5%	(Line 5 - Line 6) * Line 7