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Federal Communications Commission
Office of Secretary

April 1,1997

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

Re: Ex Parte
CC Docket No.96-262

Dear Mr. Caton:

On Monday, March 31, 1997, the attached letter, tables and one machine readable disk were sent to Anthony Bush of the FCC Staff. This material is a recompilation of detailed, historical, analysis of input inflation by Christensen Associates, Inc. used in preparation of several Total Factor Productivity Studies including those filed for the United States Telephone Association in CC Docket No. 94-1. This material is being provided at the request of Dr. Bush.

Also, USTA has provided to Dr. Bush on April 1, 1997, at his request, a copy of the 1987 Bellcore study "Econometric Estimation of the Marginal Operating Cost of Interstate Access." This study is a source from which detailed back-up data on input inflation and its components was provided on the record to Dr. Bush as part of USTA's March 24, 1997, written ex parte.

The original and a copy of this letter, and the materials and disk discussed above are attached. Please include this material in the record of the above reference proceeding.

Respectfully submitted,

Frank McKenhedy
Director - Legal and Regulatory Affairs

cc: Dr. Anthony Bush

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Federal Communications Commission
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March 31, 1997

Dr. Anthony Bush
Federal Communications Commission
1919 M Street, N. W., Room 614
Washington, D. C. 20554

Dear Dr. Bush:

As you have requested, attached are the data on the underlying LEC input inflation and the output growth as well as a machine readable disk with Lotus spread sheets described below. The basic information is already on the public record (see below).

USTA has recompiled into a table the underlying input inflation index data from each of the five telecommunications studies referenced in the USTA ex parte filed on March 24, 1997 in CC Docket No. 96-262. These tables are also in a spreadsheet in Lotus 1-2-3 WK3 format on the enclosed disk. The underlying output growth data from each of these five studies has been included in this same spreadsheet. The public record sources of this data are set out in USTA's March 24, 1997 ex parte.

This material will be filed with the Secretary of the Commission as an ex parte filing.

Respectfully submitted,

Frank G. McKennedy
Director - Legal and Regulatory Affairs

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IPD

YEAR	LEC Input Price Growth	LEC Input Price Source	U.S. Input Price Growth	U.S. Input Price Source	IPD U.S. - LEC
1949	3.2%	Bell System Study	-2.2%	BLS MFP Study	-5.4%
1950	5.1%	Bell System Study	8.3%	BLS MFP Study	3.2%
1951	8.8%	Bell System Study	8.9%	BLS MFP Study	0.1%
1952	8.6%	Bell System Study	3.0%	BLS MFP Study	-5.6%
1953	2.4%	Bell System Study	2.3%	BLS MFP Study	-0.1%
1954	1.9%	Bell System Study	1.1%	BLS MFP Study	-0.8%
1955	5.4%	Bell System Study	5.6%	BLS MFP Study	0.2%
1956	1.7%	Bell System Study	3.7%	BLS MFP Study	2.0%
1957	-1.1%	Bell System Study	4.6%	BLS MFP Study	5.7%
1958	3.3%	Bell System Study	2.0%	BLS MFP Study	-1.3%
1959	5.4%	Bell System Study	5.2%	BLS MFP Study	-0.2%
1960	4.2%	Bell System Study	1.8%	BLS MFP Study	-2.4%
1961	3.9%	Bell System Study	2.7%	BLS MFP Study	-1.2%
1962	2.2%	Bell System Study	4.3%	BLS MFP Study	2.1%
1963	1.0%	Bell System Study	3.7%	BLS MFP Study	2.7%
1964	6.0%	Bell System Study	4.8%	BLS MFP Study	-1.2%
1965	0.5%	Bell System Study	4.6%	BLS MFP Study	4.1%
1966	1.1%	Bell System Study	5.4%	BLS MFP Study	4.3%
1967	1.9%	Bell System Study	3.1%	BLS MFP Study	1.2%
1968	4.2%	Bell System Study	6.3%	BLS MFP Study	2.1%
1969	2.1%	Bell System Study	4.1%	BLS MFP Study	2.0%
1970	3.8%	Bell System Study	3.3%	BLS MFP Study	-0.5%
1971	4.2%	Bell System Study	6.6%	BLS MFP Study	2.4%
1972	8.0%	Bell System Study	7.0%	BLS MFP Study	-1.0%
1973	0.6%	Bell System Study	8.5%	BLS MFP Study	7.9%
1974	5.9%	Bell System Study	5.1%	BLS MFP Study	-0.8%
1975	14.2%	Bell System Study	9.9%	BLS MFP Study	-4.3%
1976	10.7%	Bell System Study	8.8%	BLS MFP Study	-1.9%
1977	6.1%	Bell System Study	7.9%	BLS MFP Study	1.8%
1978	7.6%	Bell System Study	8.2%	BLS MFP Study	0.6%
1979	7.2%	Bell System Study	7.4%	BLS MFP Study	0.2%
1980	14.6%	Bellcore Study	6.2%	BLS MFP Study	-8.4%
1981	11.6%	Bellcore Study	8.8%	BLS MFP Study	-2.8%
1982	12.1%	Bellcore Study	3.8%	BLS MFP Study	-8.3%
1983	12.9%	Industry Study	4.7%	BLS MFP Study	-8.2%
1984	1.8%	Industry Study	6.9%	BLS MFP Study	5.1%
1985	0.1%	LEC Study Update	3.4%	BLS MFP Study	3.3%
1986	1.3%	LEC Study Update	2.9%	BLS MFP Study	1.6%
1987	1.7%	LEC Study Update	2.8%	BLS MFP Study	1.1%
1988	-3.2%	LEC Study Update	3.7%	BLS MFP Study	6.9%
1989	-3.0%	Simplified LEC Study Update	3.4%	BLS MFP Study	6.4%
1990	3.7%	Simplified LEC Study Update	3.4%	BLS MFP Study	-0.3%
1991	3.5%	Simplified LEC Study Update	1.7%	BLS MFP Study	-1.8%
1992	5.4%	Simplified LEC Study Update	3.2%	BLS MFP Study	-2.2%
1993	5.1%	Simplified LEC Study Update	3.6%	BLS MFP Study	-1.5%
1994	2.8%	Simplified LEC Study Update	3.7%	BLS MFP Study	0.9%
1995	2.1%	Simplified LEC Study Update			
1949-1995	4.5%		4.7%		0.2%
1989-1995	2.8%		3.2%		0.4%
1991-1995	3.8%		3.1%		-0.7%

Notes

1995 data for U.S. input inflation was not available from the U.S. Department of Labor. The U.S. averages were computed using data for the 1949-1994, 1989-1994 and 1991-1994 periods respectively.

U.S. input inflation extracted from a file received from Mr. Harper of the Bureau of Labor Statistics which corresponds to USDL Press Release 95-518, January 17, 1996, Multifactor Productivity Trends - 1994.

LEC SUMMARY

SOURCE		AVERAGE ANNUAL SHARES		
		Capital Cost Share	Labor Cost Share	Materials Cost Share
Bell System Study	1948	40.00%	48.95%	11.05%
Bell System Study	1949	41.15%	47.70%	11.15%
Bell System Study	1950	43.00%	46.20%	10.80%
Bell System Study	1951	44.70%	44.75%	10.50%
Bell System Study	1952	46.00%	43.70%	10.30%
Bell System Study	1953	46.55%	43.40%	10.05%
Bell System Study	1954	46.50%	43.20%	10.20%
Bell System Study	1955	47.20%	42.10%	10.65%
Bell System Study	1956	47.75%	41.20%	11.05%
Bell System Study	1957	47.40%	41.20%	11.40%
Bell System Study	1958	48.95%	40.10%	10.95%
Bell System Study	1959	51.40%	38.05%	10.50%
Bell System Study	1960	52.55%	36.70%	10.70%
Bell System Study	1961	53.75%	35.35%	10.90%
Bell System Study	1962	54.75%	34.30%	11.00%
Bell System Study	1963	55.10%	33.65%	11.25%
Bell System Study	1964	55.65%	32.95%	11.35%
Bell System Study	1965	55.75%	32.75%	11.50%
Bell System Study	1966	54.80%	33.30%	11.90%
Bell System Study	1967	54.20%	33.90%	11.95%
Bell System Study	1968	54.35%	33.75%	11.95%
Bell System Study	1969	53.00%	34.60%	12.40%
Bell System Study	1970	50.55%	36.45%	13.00%
Bell System Study	1971	49.00%	37.70%	13.30%
Bell System Study	1972	48.10%	38.70%	13.20%
Bell System Study	1973	46.25%	40.30%	13.45%
Bell System Study	1974	44.00%	42.00%	14.00%
Bell System Study	1975	44.80%	41.55%	13.65%
Bell System Study	1976	46.60%	40.05%	13.35%
Bell System Study	1977	46.85%	39.40%	13.75%
Bell System Study	1978	46.50%	39.20%	14.30%
Bell System Study	1979	45.60%	39.50%	14.90%
Bellcore Study	1980	48.01%	38.85%	13.14%
Bellcore Study	1981	49.87%	37.05%	13.08%
Bellcore Study	1982	49.84%	37.32%	12.85%
Industry Study	1983	42.50%	41.45%	16.00%
Industry Study	1984	45.50%	38.70%	15.80%
LEC Study Update	1985	45.25%	33.94%	20.81%
LEC Study Update	1986	44.92%	33.08%	22.01%
LEC Study Update	1987	46.11%	31.89%	22.00%
LEC Study Update	1988	45.90%	31.41%	22.70%
Simplified LEC Study Update	1989	50.23%	27.00%	22.77%
Simplified LEC Study Update	1990	49.35%	26.75%	23.90%
Simplified LEC Study Update	1991	49.70%	26.24%	24.06%
Simplified LEC Study Update	1992	50.89%	25.65%	23.46%
Simplified LEC Study Update	1993	52.24%	25.39%	22.38%
Simplified LEC Study Update	1994	52.09%	25.13%	22.79%
Simplified LEC Study Update	1995	52.04%	24.09%	23.88%

LEC SUMMARY

SOURCE		ANNUAL GROWTH RATE			
		Capital Input Price	Labor Input Price	Materials Input Price	Total Input Price
Bell System Study	1948	11.22%	8.36%	7.12%	9.3%
Bell System Study	1949	2.75%	4.57%	-0.78%	3.2%
Bell System Study	1950	7.33%	3.55%	2.64%	5.1%
Bell System Study	1951	12.49%	5.78%	6.39%	8.8%
Bell System Study	1952	12.68%	5.83%	1.57%	8.6%
Bell System Study	1953	1.69%	3.41%	1.82%	2.4%
Bell System Study	1954	0.51%	3.64%	1.38%	1.9%
Bell System Study	1955	5.72%	5.79%	2.31%	5.4%
Bell System Study	1956	2.27%	0.48%	3.30%	1.7%
Bell System Study	1957	-7.10%	4.54%	3.69%	-1.1%
Bell System Study	1958	6.27%	0.31%	1.49%	3.3%
Bell System Study	1959	4.20%	7.77%	2.19%	5.4%
Bell System Study	1960	5.01%	4.28%	1.67%	4.2%
Bell System Study	1961	4.36%	4.10%	0.94%	3.9%
Bell System Study	1962	1.45%	3.57%	1.98%	2.2%
Bell System Study	1963	-0.62%	3.57%	1.37%	1.0%
Bell System Study	1964	6.69%	5.06%	4.77%	6.0%
Bell System Study	1965	-1.56%	3.61%	2.04%	0.5%
Bell System Study	1966	-1.58%	4.76%	3.03%	1.1%
Bell System Study	1967	-0.40%	5.45%	2.84%	1.9%
Bell System Study	1968	4.02%	4.78%	3.83%	4.2%
Bell System Study	1969	-3.52%	9.37%	5.07%	2.1%
Bell System Study	1970	0.30%	8.32%	5.26%	3.8%
Bell System Study	1971	-0.80%	10.53%	4.91%	4.2%
Bell System Study	1972	4.78%	13.37%	3.89%	8.0%
Bell System Study	1973	-8.45%	9.30%	5.64%	0.6%
Bell System Study	1974	-0.21%	10.59%	10.81%	5.9%
Bell System Study	1975	17.24%	12.62%	9.45%	14.2%
Bell System Study	1976	11.01%	12.02%	5.14%	10.7%
Bell System Study	1977	6.67%	5.68%	5.55%	6.1%
Bell System Study	1978	7.82%	7.51%	7.23%	7.6%
Bell System Study	1979	4.70%	9.68%	7.79%	7.2%
Bellcore Study	1980	20.37%	9.59%	8.69%	14.6%
Bellcore Study	1981	12.00%	11.87%	9.28%	11.6%
Bellcore Study	1982	8.80%	18.60%	5.90%	12.1%
Industry Study	1983	16.99%	12.09%	3.82%	12.9%
Industry Study	1984	5.31%	-2.99%	3.59%	1.8%
LEC Study Update	1985	-5.39%	5.44%	3.45%	0.1%
LEC Study Update	1986	-2.40%	5.36%	2.82%	1.3%
LEC Study Update	1987	2.82%	-0.81%	3.05%	1.7%
LEC Study Update	1988	-8.51%	-0.56%	3.83%	-3.2%
Simplified LEC Study Update	1989	-8.95%	1.97%	4.40%	-3.0%
Simplified LEC Study Update	1990	2.83%	4.55%	4.43%	3.7%
Simplified LEC Study Update	1991	1.18%	7.55%	3.95%	3.5%
Simplified LEC Study Update	1992	6.34%	5.54%	3.13%	5.4%
Simplified LEC Study Update	1993	3.33%	10.75%	2.93%	5.1%
Simplified LEC Study Update	1994	0.91%	6.74%	2.69%	2.8%
Simplified LEC Study Update	1995	1.22%	3.79%	2.49%	2.1%

LEC SUMMARY

SOURCE		ANNUAL GROWTH RATE			
		Capital Input Quant.	Labor Input Quant.	Materials Input Quant.	Total Input Index
Bell System Study	1948	7.03%	4.94%	13.20%	6.7%
Bell System Study	1949	10.33%	2.40%	7.21%	6.4%
Bell System Study	1950	5.63%	0.58%	1.59%	2.7%
Bell System Study	1951	3.02%	4.44%	5.20%	3.9%
Bell System Study	1952	3.37%	4.87%	9.06%	4.6%
Bell System Study	1953	4.49%	4.31%	2.66%	4.2%
Bell System Study	1954	6.18%	0.98%	10.71%	4.4%
Bell System Study	1955	6.20%	0.05%	8.94%	3.9%
Bell System Study	1956	6.18%	7.49%	10.70%	7.2%
Bell System Study	1957	6.76%	-3.04%	-1.35%	1.8%
Bell System Study	1958	7.78%	0.08%	-4.89%	3.3%
Bell System Study	1959	6.02%	-4.04%	8.80%	2.4%
Bell System Study	1960	4.64%	-0.07%	6.45%	3.2%
Bell System Study	1961	5.34%	-0.93%	8.40%	3.5%
Bell System Study	1962	5.56%	0.30%	3.24%	3.5%
Bell System Study	1963	6.01%	-0.10%	8.82%	4.3%
Bell System Study	1964	5.44%	3.09%	1.46%	4.4%
Bell System Study	1965	6.13%	3.38%	10.58%	5.6%
Bell System Study	1966	6.24%	4.02%	5.21%	5.4%
Bell System Study	1967	6.13%	1.75%	2.15%	4.2%
Bell System Study	1968	5.29%	1.61%	5.47%	4.1%
Bell System Study	1969	5.30%	5.40%	9.36%	5.8%
Bell System Study	1970	6.38%	5.17%	8.12%	6.2%
Bell System Study	1971	6.29%	1.10%	4.55%	4.1%
Bell System Study	1972	6.07%	0.19%	4.71%	3.6%
Bell System Study	1973	6.24%	1.66%	6.19%	4.4%
Bell System Study	1974	6.36%	0.75%	-0.45%	3.1%
Bell System Study	1975	5.64%	-0.46%	0.71%	2.4%
Bell System Study	1976	4.11%	-1.35%	10.50%	2.8%
Bell System Study	1977	3.19%	4.12%	8.61%	4.3%
Bell System Study	1978	3.40%	4.28%	8.61%	4.5%
Bell System Study	1979	4.03%	2.13%	8.51%	4.7%
Bellcore Study	1980	4.46%	1.38%	6.26%	3.5%
Bellcore Study	1981	4.58%	1.51%	8.46%	4.0%
Bellcore Study	1982	3.12%	-1.93%	1.36%	1.0%
Industry Study	1983	3.93%	-10.07%	-1.26%	-2.7%
Industry Study	1984	3.44%	3.22%	6.94%	3.9%
LEC Study Update	1985	3.93%	-5.77%	7.16%	1.3%
LEC Study Update	1986	5.39%	-7.23%	0.87%	0.2%
LEC Study Update	1987	4.53%	0.54%	-1.63%	1.9%
LEC Study Update	1988	3.68%	1.25%	4.28%	3.1%
Simplified LEC Study Update	1989	3.83%	-1.56%	6.22%	2.9%
Simplified LEC Study Update	1990	2.49%	-3.11%	-1.48%	0.0%
Simplified LEC Study Update	1991	2.88%	-4.87%	2.47%	0.7%
Simplified LEC Study Update	1992	2.44%	-4.62%	-6.55%	-1.5%
Simplified LEC Study Update	1993	2.53%	-4.37%	0.46%	0.3%
Simplified LEC Study Update	1994	2.26%	-5.60%	7.11%	1.4%
Simplified LEC Study Update	1995	2.00%	-6.87%	3.65%	0.3%

LEC SUMMARY

SOURCE		ANNUAL GROWTH RATE			
		Total Output Index	LEC TFP Growth	U.S. MFP Growth	TFP Diff.
Bell System Study	1948	10.0%	3.3%		
Bell System Study	1949	5.1%	-1.1%	1.4%	-2.5%
Bell System Study	1950	7.4%	4.5%	7.0%	-2.5%
Bell System Study	1951	8.7%	4.8%	2.3%	2.5%
Bell System Study	1952	6.9%	2.3%	0.8%	1.5%
Bell System Study	1953	5.1%	0.9%	2.4%	-1.5%
Bell System Study	1954	5.2%	0.8%	0.0%	0.8%
Bell System Study	1955	9.1%	5.2%	4.4%	0.8%
Bell System Study	1956	8.7%	1.4%	-0.6%	2.0%
Bell System Study	1957	7.0%	5.2%	1.6%	3.6%
Bell System Study	1958	4.9%	1.6%	0.6%	1.0%
Bell System Study	1959	8.2%	5.8%	3.3%	2.5%
Bell System Study	1960	7.1%	3.9%	0.4%	3.5%
Bell System Study	1961	5.7%	2.2%	2.2%	0.0%
Bell System Study	1962	6.5%	3.0%	3.7%	-0.7%
Bell System Study	1963	6.6%	2.3%	2.9%	-0.6%
Bell System Study	1964	7.5%	3.1%	4.1%	-1.0%
Bell System Study	1965	8.4%	2.9%	2.9%	0.0%
Bell System Study	1966	9.7%	4.3%	3.0%	1.3%
Bell System Study	1967	7.4%	3.3%	0.4%	2.9%
Bell System Study	1968	8.4%	4.4%	2.7%	1.7%
Bell System Study	1969	9.6%	3.8%	-0.3%	4.1%
Bell System Study	1970	6.8%	0.6%	-0.2%	0.8%
Bell System Study	1971	5.2%	1.1%	3.2%	-2.1%
Bell System Study	1972	7.7%	4.0%	2.8%	1.2%
Bell System Study	1973	8.7%	4.3%	2.9%	1.4%
Bell System Study	1974	6.8%	3.7%	-3.4%	7.1%
Bell System Study	1975	5.2%	2.8%	0.8%	2.0%
Bell System Study	1976	7.2%	4.4%	3.6%	0.8%
Bell System Study	1977	7.9%	3.6%	2.2%	1.4%
Bell System Study	1978	9.2%	4.8%	0.7%	4.1%
Bell System Study	1979	8.8%	4.2%	-0.7%	4.9%
Bellcore Study	1980	8.6%	5.1%	-2.4%	7.5%
Bellcore Study	1981	4.5%	0.5%	0.3%	0.2%
Bellcore Study	1982	2.0%	1.0%	-3.2%	4.2%
Industry Study	1983	1.7%	4.3%	2.1%	2.2%
Industry Study	1984	1.7%	-2.2%	3.1%	-5.3%
LEC Study Update	1985	2.4%	1.1%	0.5%	0.6%
LEC Study Update	1986	3.0%	2.8%	1.0%	1.8%
LEC Study Update	1987	3.7%	1.8%	0.2%	1.6%
LEC Study Update	1988	5.2%	2.1%	0.5%	1.6%
Simplified LEC Study Update	1989	4.7%	1.8%	-0.3%	2.1%
Simplified LEC Study Update	1990	3.8%	3.8%	-0.1%	3.9%
Simplified LEC Study Update	1991	2.7%	2.0%	-1.0%	3.0%
Simplified LEC Study Update	1992	2.0%	3.5%	1.4%	2.1%
Simplified LEC Study Update	1993	4.0%	3.7%	0.5%	3.2%
Simplified LEC Study Update	1994	3.8%	2.4%	0.8%	1.6%
Simplified LEC Study Update	1995	4.1%	3.8%		

EXTRACT

SOURCE		Capital Cost Share	Labor Cost Share	Materials Cost Share	Capital Input Price	Labor Input Price	Materials Input Price	Capital Input Quant.	Labor Input Quant.	Materials Input Quant.	Aggregate Output Index
Bell System Study	1947	0.396	0.496	0.108	0.480	0.413	0.596	2101.8	3065.5	462.7	2995.2
Bell System Study	1948	0.404	0.483	0.113	0.537	0.449	0.640	2254.9	3220.8	528.0	3309.7
Bell System Study	1949	0.419	0.471	0.110	0.552	0.470	0.635	2500.3	3299.0	567.5	3483.0
Bell System Study	1950	0.441	0.453	0.106	0.594	0.487	0.652	2645.2	3318.3	576.6	3750.1
Bell System Study	1951	0.453	0.442	0.104	0.673	0.516	0.695	2726.4	3469.1	607.4	4091.0
Bell System Study	1952	0.467	0.432	0.102	0.764	0.547	0.706	2819.9	3642.3	665.0	4384.6
Bell System Study	1953	0.464	0.436	0.099	0.777	0.566	0.719	2949.4	3802.9	682.9	4614.8
Bell System Study	1954	0.466	0.428	0.105	0.781	0.587	0.729	3137.5	3840.3	760.1	4860.3
Bell System Study	1955	0.478	0.414	0.108	0.827	0.622	0.746	3338.1	3842.1	831.2	5321.1
Bell System Study	1956	0.477	0.410	0.113	0.846	0.625	0.771	3550.9	4141.0	925.1	5802.0
Bell System Study	1957	0.471	0.414	0.115	0.788	0.654	0.800	3799.3	4017.1	912.7	6220.0
Bell System Study	1958	0.508	0.388	0.104	0.839	0.656	0.812	4106.6	4020.2	869.1	6529.8
Bell System Study	1959	0.520	0.373	0.106	0.875	0.709	0.830	4361.5	3861.0	949.0	7085.6
Bell System Study	1960	0.531	0.361	0.108	0.920	0.740	0.844	4568.6	3858.2	1012.2	7606.3
Bell System Study	1961	0.544	0.346	0.110	0.961	0.771	0.852	4819.3	3822.5	1100.9	8050.9
Bell System Study	1962	0.551	0.340	0.110	0.975	0.799	0.869	5094.6	3833.9	1137.1	8590.9
Bell System Study	1963	0.551	0.333	0.115	0.969	0.828	0.881	5410.4	3830.0	1242.0	9175.8
Bell System Study	1964	0.562	0.326	0.112	1.036	0.871	0.924	5713.1	3950.3	1260.3	9885.9
Bell System Study	1965	0.553	0.329	0.118	1.020	0.903	0.943	6074.5	4086.3	1400.9	10754.0
Bell System Study	1966	0.543	0.337	0.120	1.004	0.947	0.972	6465.5	4253.8	1475.8	11847.9
Bell System Study	1967	0.541	0.341	0.119	1.000	1.000	1.000	6874.0	4329.1	1507.8	12760.6
Bell System Study	1968	0.546	0.334	0.120	1.041	1.049	1.039	7247.4	4399.3	1592.6	13882.9
Bell System Study	1969	0.514	0.358	0.128	1.005	1.152	1.093	7641.6	4643.3	1748.9	15287.1
Bell System Study	1970	0.497	0.371	0.132	1.008	1.252	1.152	8144.7	4889.6	1896.9	16359.3
Bell System Study	1971	0.483	0.383	0.134	1.000	1.391	1.210	8673.2	4943.5	1985.3	17240.2
Bell System Study	1972	0.479	0.391	0.130	1.049	1.590	1.258	9216.3	4953.0	2081.1	18611.0
Bell System Study	1973	0.446	0.415	0.139	0.964	1.745	1.331	9809.3	5035.7	2214.0	20294.9
Bell System Study	1974	0.434	0.425	0.141	0.962	1.940	1.483	10453.9	5073.8	2204.0	21718.9
Bell System Study	1975	0.462	0.406	0.132	1.143	2.201	1.630	11060.5	5050.7	2219.6	22878.6
Bell System Study	1976	0.470	0.395	0.135	1.276	2.462	1.716	11525.1	4983.1	2465.3	24585.8
Bell System Study	1977	0.467	0.393	0.140	1.364	2.627	1.814	11899.0	5192.5	2687.1	26599.6
Bell System Study	1978	0.463	0.391	0.146	1.475	2.832	1.950	12310.3	5419.7	2928.7	29177.2
Bell System Study	1979	0.449	0.399	0.152	1.546	3.120	2.108	12817.0	5536.3	3188.8	31876.7
Bellcore Study	1979	0.464	0.402	0.134	1.186	1.189	1.634	17177.5	14849.9	3585.6	44486.92
Bellcore Study	1980	0.496	0.375	0.129	1.454	1.309	1.783	17960.6	15056.1	3817.2	48492.53
Bellcore Study	1981	0.501	0.367	0.132	1.639	1.474	1.956	18802.2	15285.6	4154.2	50717.49
Bellcore Study	1982	0.495	0.380	0.125	1.790	1.775	2.075	19397.2	14992.9	4211.2	51725.33
Industry Study	1982	0.402	0.431	0.166	0.055	0.130	0.062	1.372	1.117	1.353	1.442
Industry Study	1983	0.448	0.398	0.154	0.170	0.121	0.038	1.427	1.010	1.336	1.466
Industry Study	1984	0.462	0.376	0.162	0.053	-0.030	0.036	1.477	1.043	1.432	1.491
1993 Update	1984	0.459	0.342	0.199							
1993 Update	1985	0.446	0.336	0.218	-5.39%	5.44%	3.45%	3.93%	-5.77%	7.16%	1
1993 Update	1986	0.452	0.325	0.222	-2.40%	5.36%	2.82%	5.39%	-7.23%	0.87%	1.024451
1993 Update	1987	0.470	0.313	0.218	2.82%	-0.81%	3.05%	4.53%	0.54%	-1.63%	1.05599
1993 Update	1988	0.448	0.315	0.236	-8.51%	-0.56%	3.83%	3.68%	1.25%	4.28%	1.096113
1995 TFPRP	1989	0.502	0.270	0.228	-8.95%	1.97%	4.40%	3.83%	-1.56%	6.22%	4.70%
1995 TFPRP	1990	0.494	0.268	0.239	2.83%	4.55%	4.43%	2.49%	-3.11%	-1.48%	3 84%
1995 TFPRP	1991	0.497	0.262	0.241	1.18%	7.55%	3.95%	2.88%	-4.87%	2.47%	2.71%
1995 TFPRP	1992	0.509	0.256	0.235	6.34%	5.54%	3.13%	2.44%	-4.62%	-6.55%	2 01%
1995 TFPRP	1993	0.522	0.254	0.224	3.33%	10.75%	2.93%	2.53%	-4.37%	0.46%	4 01%
1995 TFPRP	1994	0.521	0.251	0.228	0.91%	6.74%	2.69%	2.26%	-5.60%	7.11%	3 82%
1995 TFPRP	1995	0.520	0.241	0.239	1.22%	3.79%	2.49%	2.00%	-6.87%	3.65%	4 09%

EXTRACT

SOURCE		Capital Cost Share	Labor Cost Share	Materials Cost Share
Bell System Study	1947	0.396	0.496	0.108
Bell System Study	1948	0.404	0.483	0.113
Bell System Study	1949	0.419	0.471	0.110
Bell System Study	1950	0.441	0.453	0.106
Bell System Study	1951	0.453	0.442	0.104
Bell System Study	1952	0.467	0.432	0.102
Bell System Study	1953	0.464	0.436	0.099
Bell System Study	1954	0.466	0.428	0.105
Bell System Study	1955	0.478	0.414	0.108
Bell System Study	1956	0.477	0.410	0.113
Bell System Study	1957	0.471	0.414	0.115
Bell System Study	1958	0.508	0.388	0.104
Bell System Study	1959	0.520	0.373	0.106
Bell System Study	1960	0.531	0.361	0.108
Bell System Study	1961	0.544	0.346	0.110
Bell System Study	1962	0.551	0.340	0.110
Bell System Study	1963	0.551	0.333	0.115
Bell System Study	1964	0.562	0.326	0.112
Bell System Study	1965	0.553	0.329	0.118
Bell System Study	1966	0.543	0.337	0.120
Bell System Study	1967	0.541	0.341	0.119
Bell System Study	1968	0.546	0.334	0.120
Bell System Study	1969	0.514	0.358	0.128
Bell System Study	1970	0.497	0.371	0.132
Bell System Study	1971	0.483	0.383	0.134
Bell System Study	1972	0.479	0.391	0.130
Bell System Study	1973	0.446	0.415	0.139
Bell System Study	1974	0.434	0.425	0.141
Bell System Study	1975	0.462	0.406	0.132
Bell System Study	1976	0.470	0.395	0.135
Bell System Study	1977	0.467	0.393	0.140
Bell System Study	1978	0.463	0.391	0.146
Bell System Study	1979	0.449	0.399	0.152
Bellcore Study	1979	0.464	0.402	0.134
Bellcore Study	1980	0.496	0.375	0.129
Bellcore Study	1981	0.501	0.367	0.132
Bellcore Study	1982	0.495	0.380	0.125
Industry Study	1982	0.402	0.431	0.166
Industry Study	1983	0.448	0.398	0.154
Industry Study	1984	0.462	0.376	0.162
1993 Update	1984	0.459	0.342	0.199
1993 Update	1985	0.446	0.336	0.218
1993 Update	1986	0.452	0.325	0.222
1993 Update	1987	0.470	0.313	0.218
1993 Update	1988	0.448	0.315	0.236
1995 TFPRP	1989	0.502	0.270	0.228
1995 TFPRP	1990	0.494	0.268	0.239
1995 TFPRP	1991	0.497	0.262	0.241
1995 TFPRP	1992	0.509	0.256	0.235
1995 TFPRP	1993	0.522	0.254	0.224
1995 TFPRP	1994	0.521	0.251	0.228
1995 TFPRP	1995	0.520	0.241	0.239

EXTRACT

SOURCE		Capital Input Price	Labor Input Price	Materials Input Price
Bell System Study	1947	0.480	0.413	0.596
Bell System Study	1948	0.537	0.449	0.640
Bell System Study	1949	0.552	0.470	0.635
Bell System Study	1950	0.594	0.487	0.652
Bell System Study	1951	0.673	0.516	0.695
Bell System Study	1952	0.764	0.547	0.706
Bell System Study	1953	0.777	0.566	0.719
Bell System Study	1954	0.781	0.587	0.729
Bell System Study	1955	0.827	0.622	0.746
Bell System Study	1956	0.846	0.625	0.771
Bell System Study	1957	0.788	0.654	0.800
Bell System Study	1958	0.839	0.656	0.812
Bell System Study	1959	0.875	0.709	0.830
Bell System Study	1960	0.920	0.740	0.844
Bell System Study	1961	0.961	0.771	0.852
Bell System Study	1962	0.975	0.799	0.869
Bell System Study	1963	0.969	0.828	0.881
Bell System Study	1964	1.036	0.871	0.924
Bell System Study	1965	1.020	0.903	0.943
Bell System Study	1966	1.004	0.947	0.972
Bell System Study	1967	1.000	1.000	1.000
Bell System Study	1968	1.041	1.049	1.039
Bell System Study	1969	1.005	1.152	1.093
Bell System Study	1970	1.008	1.252	1.152
Bell System Study	1971	1.000	1.391	1.210
Bell System Study	1972	1.049	1.590	1.258
Bell System Study	1973	0.964	1.745	1.331
Bell System Study	1974	0.962	1.940	1.483
Bell System Study	1975	1.143	2.201	1.630
Bell System Study	1976	1.276	2.482	1.716
Bell System Study	1977	1.364	2.627	1.814
Bell System Study	1978	1.475	2.832	1.950
Bell System Study	1979	1.546	3.120	2.108
Bellcore Study	1979	1.186	1.189	1.634
Bellcore Study	1980	1.454	1.309	1.783
Bellcore Study	1981	1.639	1.474	1.956
Bellcore Study	1982	1.790	1.775	2.075
Industry Study	1982	0.055	0.130	0.062
Industry Study	1983	0.170	0.121	0.038
Industry Study	1984	0.053	-0.030	0.036
1993 Update	1984			
1993 Update	1985	-5.39%	5.44%	3.45%
1993 Update	1986	-2.40%	5.36%	2.82%
1993 Update	1987	2.82%	-0.81%	3.05%
1993 Update	1988	-8.51%	-0.56%	3.83%
1995 TFPRP	1989	-8.95%	1.97%	4.40%
1995 TFPRP	1990	2.83%	4.55%	4.43%
1995 TFPRP	1991	1.18%	7.55%	3.95%
1995 TFPRP	1992	6.34%	5.54%	3.13%
1995 TFPRP	1993	3.33%	10.75%	2.93%
1995 TFPRP	1994	0.91%	6.74%	2.69%
1995 TFPRP	1995	1.22%	3.79%	2.49%

EXTRACT

SOURCE		Capital Input Quant.	Labor Input Quant.	Materials Input Quant.	Aggregate Output Index
Bell System Study	1947	2101.8	3065.5	462.7	2995.2
Bell System Study	1948	2254.9	3220.8	528.0	3309.7
Bell System Study	1949	2500.3	3299.0	567.5	3483.0
Bell System Study	1950	2645.2	3318.3	576.6	3750.1
Bell System Study	1951	2726.4	3469.1	607.4	4091.0
Bell System Study	1952	2819.9	3642.3	665.0	4384.6
Bell System Study	1953	2949.4	3802.9	682.9	4614.8
Bell System Study	1954	3137.5	3840.3	760.1	4860.3
Bell System Study	1955	3338.1	3842.1	831.2	5321.1
Bell System Study	1956	3550.9	4141.0	925.1	5802.0
Bell System Study	1957	3799.3	4017.1	912.7	6220.0
Bell System Study	1958	4106.6	4020.2	869.1	6529.8
Bell System Study	1959	4361.5	3861.0	949.0	7085.6
Bell System Study	1960	4568.6	3858.2	1012.2	7606.3
Bell System Study	1961	4819.3	3822.5	1100.9	8050.9
Bell System Study	1962	5094.6	3833.9	1137.1	8590.9
Bell System Study	1963	5410.4	3830.0	1242.0	9175.8
Bell System Study	1964	5713.1	3950.3	1260.3	9885.9
Bell System Study	1965	6074.5	4086.3	1400.9	10754.0
Bell System Study	1966	6465.5	4253.8	1475.8	11847.9
Bell System Study	1967	6874.0	4329.1	1507.8	12760.6
Bell System Study	1968	7247.4	4399.3	1592.6	13882.9
Bell System Study	1969	7641.6	4643.3	1748.9	15287.1
Bell System Study	1970	8144.7	4889.6	1896.9	16359.3
Bell System Study	1971	8673.2	4943.5	1985.3	17240.2
Bell System Study	1972	9216.3	4953.0	2081.1	18611.0
Bell System Study	1973	9809.3	5035.7	2214.0	20294.9
Bell System Study	1974	10453.9	5073.8	2204.0	21718.9
Bell System Study	1975	11060.5	5050.7	2219.6	22878.6
Bell System Study	1976	11525.1	4983.1	2465.3	24585.8
Bell System Study	1977	11899.0	5192.5	2687.1	26599.6
Bell System Study	1978	12310.3	5419.7	2928.7	29177.2
Bell System Study	1979	12817.0	5536.3	3188.8	31876.7
Bellcore Study	1979	17177.5	14849.9	3585.6	44486.92
Bellcore Study	1980	17960.6	15056.1	3817.2	48492.53
Bellcore Study	1981	18802.2	15285.6	4154.2	50717.49
Bellcore Study	1982	19397.2	14992.9	4211.2	51725.33
Industry Study	1982	1.372	1.117	1.353	1.442
Industry Study	1983	1.427	1.010	1.336	1.466
Industry Study	1984	1.477	1.043	1.432	1.491
1993 Update	1984				
1993 Update	1985	3.93%	-5.77%	7.16%	1.0000
1993 Update	1986	5.39%	-7.23%	0.87%	1.0245
1993 Update	1987	4.53%	0.54%	-1.63%	1.0560
1993 Update	1988	3.68%	1.25%	4.28%	1.0961
1995 TFPRP	1989	3.83%	-1.56%	6.22%	4.70%
1995 TFPRP	1990	2.49%	-3.11%	-1.48%	3.84%
1995 TFPRP	1991	2.88%	-4.87%	2.47%	2.71%
1995 TFPRP	1992	2.44%	-4.62%	-6.55%	2.01%
1995 TFPRP	1993	2.53%	-4.37%	0.46%	4.01%
1995 TFPRP	1994	2.26%	-5.60%	7.11%	3.82%
1995 TFPRP	1995	2.00%	-6.87%	3.65%	4.09%

Bell System Study

TABLE 17
ANNUAL COST SHARES

	CAPITAL	LABOR	MR&S
1947	0.396	0.496	0.108
1948	0.404	0.483	0.113
1949	0.419	0.471	0.110
1950	0.441	0.453	0.106
1951	0.453	0.442	0.104
1952	0.467	0.432	0.102
1953	0.464	0.436	0.099
1954	0.466	0.428	0.105
1955	0.478	0.414	0.108
1956	0.477	0.410	0.113
1957	0.471	0.414	0.115
1958	0.508	0.388	0.104
1959	0.520	0.373	0.106
1960	0.531	0.361	0.108
1961	0.544	0.346	0.110
1962	0.551	0.340	0.110
1963	0.551	0.333	0.115
1964	0.562	0.326	0.112
1965	0.553	0.329	0.118
1966	0.543	0.337	0.120
1967	0.541	0.341	0.119
1968	0.546	0.334	0.120
1969	0.514	0.358	0.128
1970	0.497	0.371	0.132
1971	0.483	0.383	0.134
1972	0.479	0.391	0.130
1973	0.446	0.415	0.139
1974	0.434	0.425	0.141
1975	0.462	0.406	0.132
1976	0.470	0.395	0.135
1977	0.467	0.393	0.140
1978	0.463	0.391	0.146
1979	0.449	0.399	0.152

Bell System Study

	Input Price			
	Table 15 Capital Input Price	Table 6 Labor Input Price	Table 16 Materials Input Price	Table 20 Total Input Price
1947	0.480	0.413	0.596	0.472
1948	0.537	0.449	0.640	0.518
1949	0.552	0.470	0.635	0.535
1950	0.594	0.487	0.652	0.563
1951	0.673	0.516	0.695	0.615
1952	0.764	0.547	0.706	0.670
1953	0.777	0.566	0.719	0.686
1954	0.781	0.587	0.729	0.699
1955	0.827	0.622	0.746	0.738
1956	0.846	0.625	0.771	0.751
1957	0.788	0.654	0.800	0.743
1958	0.839	0.656	0.812	0.768
1959	0.875	0.709	0.830	0.811
1960	0.920	0.740	0.844	0.846
1961	0.961	0.771	0.852	0.880
1962	0.975	0.799	0.869	0.900
1963	0.969	0.828	0.881	0.909
1964	1.036	0.871	0.924	0.965
1965	1.020	0.903	0.943	0.970
1966	1.004	0.947	0.972	0.981
1967	1.000	1.000	1.000	1.000
1968	1.041	1.049	1.039	1.043
1969	1.005	1.152	1.093	1.065
1970	1.008	1.252	1.152	1.106
1971	1.000	1.391	1.210	1.154
1972	1.049	1.590	1.258	1.250
1973	0.964	1.745	1.331	1.258
1974	0.962	1.940	1.483	1.334
1975	1.143	2.201	1.630	1.538
1976	1.276	2.482	1.716	1.711
1977	1.364	2.627	1.814	1.819
1978	1.475	2.832	1.950	1.962
1979	1.546	3.120	2.108	2.108

Bell System Study

	Input Quantity			
	Table 15 Capital Input Quant.	Table 6 Labor Input Quant.	Table 16 Materials Input Quant.	Table 20 Total Input Quant.
1947	2,101.8	3,065.5	462.7	5,410.1
1948	2,254.9	3,220.8	528.0	5,784.4
1949	2,500.3	3,299.0	567.5	6,164.5
1950	2,645.2	3,318.3	576.6	6,333.2
1951	2,726.4	3,469.1	607.4	6,584.4
1952	2,819.9	3,642.3	665.0	6,895.3
1953	2,949.4	3,802.9	682.9	7,193.2
1954	3,137.5	3,840.3	760.1	7,516.5
1955	3,338.1	3,842.1	831.2	7,815.3
1956	3,550.9	4,141.0	925.1	8,400.4
1957	3,799.3	4,017.1	912.7	8,552.9
1958	4,106.6	4,020.2	869.1	8,840.0
1959	4,361.5	3,861.0	949.0	9,054.0
1960	4,568.6	3,858.2	1,012.2	9,348.0
1961	4,819.3	3,822.5	1,100.9	9,677.0
1962	5,094.6	3,833.9	1,137.1	10,021.4
1963	5,410.4	3,830.0	1,242.0	10,458.6
1964	5,713.1	3,950.3	1,260.3	10,928.4
1965	6,074.5	4,086.3	1,400.9	11,553.6
1966	6,465.5	4,253.8	1,475.8	12,191.7
1967	6,874.0	4,329.1	1,507.8	12,710.9
1968	7,247.4	4,399.3	1,592.6	13,238.9
1969	7,641.6	4,643.3	1,748.9	14,034.3
1970	8,144.7	4,889.6	1,896.9	14,926.5
1971	8,673.2	4,943.5	1,985.3	15,551.3
1972	9,216.3	4,953.0	2,081.1	16,124.2
1973	9,809.3	5,035.7	2,214.0	16,846.9
1974	10,453.9	5,073.8	2,204.0	17,369.4
1975	11,060.5	5,050.7	2,219.6	17,797.3
1976	11,525.1	4,983.1	2,465.3	18,299.0
1977	11,899.0	5,192.5	2,687.1	19,103.6
1978	12,310.3	5,419.7	2,928.7	19,981.0
1979	12,817.0	5,536.3	3,188.8	20,933.1

Bell System Study

	Table 3 Aggregate Output Index	Table 19 TFP Index	Table 19 TFP Growth
1947	2995.2	0.551	
1948	3309.7	0.571	3.30%
1949	3483.0	0.564	-1.10%
1950	3750.1	0.590	4.50%
1951	4091.0	0.619	4.80%
1952	4384.6	0.633	2.30%
1953	4614.8	0.639	0.90%
1954	4860.3	0.644	0.80%
1955	5321.1	0.678	5.20%
1956	5802.0	0.688	1.40%
1957	6220.0	0.724	5.20%
1958	6529.8	0.736	1.60%
1959	7085.6	0.780	5.80%
1960	7606.3	0.811	3.90%
1961	8050.9	0.829	2.20%
1962	8590.9	0.854	3.00%
1963	9175.8	0.874	2.30%
1964	9885.9	0.901	3.10%
1965	10754.0	0.927	2.90%
1966	11847.9	0.968	4.30%
1967	12760.6	1.000	3.30%
1968	13882.9	1.045	4.40%
1969	15287.1	1.085	3.80%
1970	16359.3	1.092	0.60%
1971	17240.2	1.104	1.10%
1972	18611.0	1.150	4.00%
1973	20294.9	1.200	4.30%
1974	21718.9	1.246	3.70%
1975	22878.6	1.280	2.80%
1976	24585.8	1.228	4.40%
1977	26599.6	1.387	3.60%
1978	29177.2	1.455	4.80%
1979	31876.7	1.517	4.20%

Bellcore Study

year	Bell System Input Materials Value	Price	Quantity	Labor Value	Price	Quantity	Capital Value	Price	Quantity
1979	5860.1	1.634	3585.6	17660.3	1.189	14849.9	20367.8	1.186	17177.5
1980	6804.7	1.783	3817.2	19708.6	1.309	15056.1	26108.4	1.454	17960.6
1981	8126.1	1.956	4154.2	22529.9	1.474	15285.6	30814.9	1.639	18802.2
1982	8738.4	2.075	4211.2	26615.5	1.775	14992.9	34712.9	1.790	19397.2

Annual Growth Rates

year	Bell System Input Materials Value	Price	Quantity	Labor Value	Price	Quantity	Capital Value	Price	Quantity
1979	13.9%	8.3%	5.7%	14.0%	9.4%	4.6%	13.1%	8.9%	4.2%
1980	14.9%	8.7%	6.3%	11.0%	9.6%	1.4%	24.8%	20.4%	4.5%
1981	17.7%	9.3%	8.5%	13.4%	11.9%	1.5%	16.6%	12.0%	4.6%
1982	7.3%	5.9%	1.4%	16.7%	18.6%	-1.9%	11.9%	8.8%	3.1%

year	Output	Input	TFP	TFP Growth	Total Input Cost	Quantity	Price
1979	44486.9	25719.0	1.73	4.9%	13.6%	4.6%	9.0%
1980	48492.5	26634.7	1.82	5.1%	18.1%	3.5%	14.6%
1981	50717.5	27708.0	1.83	0.5%	15.5%	4.0%	11.6%
1982	51725.3	27988.2	1.85	1.0%	13.1%	1.0%	12.1%

Industry Study

	Quantity Index of Capital Input	Quantity Index of Labor Input	Quantity Index of Materials Input
1982 PRICE.WK3	1.372	1.117	1.353
1983 PRICE.WK3	1.427	1.010	1.336
1984 PRICE.WK3	1.477	1.043	1.432

	Input Cost Growth Total	Input Cost Growth Capital	Input Cost Growth Labor	Input Cost Growth Material	Annual Cost Share Capital	Annual Cost Share Labor	Annual Cost Share Material
1982 PRICE.WK3	8.85%	5.51%	12.96%	6.23%	0.402	0.431	0.166
1983 PRICE.WK3	12.85%	16.99%	12.09%	3.82%	0.448	0.398	0.154
1984 PRICE.WK3	1.83%	5.31%	-2.99%	3.59%	0.462	0.376	0.162

North Dakota Testimony	Output Index	Input Index	TFP Index
1982 North Dakota Testimony	1.442	1.254	1.150
1983 North Dakota Testimony	1.466	1.221	1.201
1984 North Dakota Testimony	1.491	1.270	1.174

	Output Growth	Input Growth	TFP Growth
1982 North Dakota Testimony	2.5%	3.0%	-0.5%
1983 North Dakota Testimony	1.7%	-2.7%	4.3%
1984 North Dakota Testimony	1.7%	3.9%	-2.2%

1995 Total Factor Productivity Review Plan
Index of Total Input

	Item	Source	1988	1989	1990	1991
	INPUT COSTS					
100	Capital	CAP1,I.1190	43,041,036,285	40,893,132,333	43,129,828,736	44,919,636,862
110	Labor	LABMRS1,I.120	22,511,293,000	22,603,070,000	22,930,727,000	23,553,774,000
120	MR&S	LABMRS1,I.340	18,018,313,000	20,036,512,000	20,637,470,000	22,006,899,000
130	Total Input Cost	Sum of 100 thru 120	83,570,642,285	83,532,714,333	86,698,025,736	90,480,309,862
	AVERAGE OF SHARES					
200	Capital	[I.100(t-1)/I.130(t-1)+I.100(t)/I.130(t)]/2	N/A	50.23%	49.35%	49.70%
210	Labor	[I.110(t-1)/I.130(t-1)+I.110(t)/I.130(t)]/2	N/A	27.00%	26.75%	26.24%
220	MR&S	[I.120(t-1)/I.130(t-1)+I.120(t)/I.130(t)]/2	N/A	22.77%	23.90%	24.06%
	INPUT QUANTITY GROWTH					
300	Capital	CAP1,I.1850	N/A	3.83%	2.49%	2.88%
310	Labor	LABMRS1,I.220	N/A	-1.56%	-3.11%	-4.87%
320	MR&S	LABMRS1,I.390	N/A	6.22%	-1.48%	2.47%
COMPUTED	INPUT COST GROWTH					
1000	Capital	Growth of Line 100		-5.12%	5.33%	4.07%
1100	Labor	Growth of Line 110		0.41%	1.44%	2.68%
1200	MR&S	Growth of Line 120		10.82%	2.96%	6.42%
COMPUTED	INPUT PRICE GROW H					
	[COST GROWTH - QUANTITY GROWTH]					
	Capital	Line 1000 - Line 300		-8.95%	2.83%	1.18%
	Labor	Line 1100 - Line 310		1.97%	4.55%	7.55%
	MR&S	Line 1200 - Line 320		4.40%	4.43%	3.95%
TOTAL INPUT GROWTH			N/A	2.92%	0.04%	0.75%
TOTAL OUTPUT GROWTH			N/A	4.70%	3.84%	2.71%
LEC Total Factor Productivity			N/A	1.79%	3.80%	1.96%

TFPRP 1995

	Item	1992	1993	1994	1995
	INPUT COSTS				
100	Capital	49,042,001,677	51,999,676,231	53,677,635,141	55,433,213,633
110	Labor	23,771,955,000	25,336,928,000	25,627,805,000	24,852,027,000
120	MR&S	21,266,418,000	22,000,434,000	24,265,611,000	25,802,859,000
130	Total Input Cost	94,080,374,677	99,337,038,231	103,571,051,141	106,088,099,633
	AVERAGE OF SHARE				
200	Capital	50.89%	52.24%	52.09%	52.04%
210	Labor	25.65%	25.39%	25.13%	24.09%
220	MR&S	23.46%	22.38%	22.79%	23.88%
	INPUT QUANTITY GR				
300	Capital	2.44%	2.53%	2.26%	2.00%
310	Labor	-4.62%	-4.37%	-5.60%	-6.87%
320	MR&S	-6.55%	0.46%	7.11%	3.65%
COMPUTED	INPUT COST GROWT				
1000	Capital	8.78%	5.86%	3.18%	3.22%
1100	Labor	0.92%	6.38%	1.14%	-3.07%
1200	MR&S	-3.42%	3.39%	9.80%	6.14%
COMPUTED	INPUT PRICE GROW				
	[COST GROWTH - QU				
	Capital	6.34%	3.33%	0.91%	1.22%
	Labor	5.54%	10.75%	6.74%	3.79%
	MR&S	3.13%	2.93%	2.69%	2.49%
TOTAL INPUT GROWTH		-1.48%	0.31%	1.39%	0.26%
TOTAL OUTPUT GROWTH		2.01%	4.01%	3.82%	4.09%
LEC Total Factor Productivity		3.49%	3.70%	2.43%	3.83%

U.S. DATA

	U.S. PRVATE BUSINESS SECTOR			
	INPUT PRICE		MULTIFACTOR PRPDUCTIVITY	
	INDEX	GROWTH	INDEX	GROWTH
1948	14.1		55.6	
1949	13.8	-2.15%	56.4	1.43%
1950	15.0	8.34%	60.5	7.02%
1951	16.4	8.92%	61.9	2.29%
1952	16.9	3.00%	62.4	0.80%
1953	17.3	2.34%	63.9	2.38%
1954	17.5	1.15%	63.9	0.00%
1955	18.5	5.56%	66.8	4.44%
1956	19.2	3.71%	66.4	-0.60%
1957	20.1	4.58%	67.5	1.64%
1958	20.5	1.97%	67.9	0.59%
1959	21.6	5.23%	70.2	3.33%
1960	22.0	1.83%	70.5	0.43%
1961	22.6	2.69%	72.1	2.24%
1962	23.6	4.33%	74.8	3.68%
1963	24.5	3.74%	77.0	2.90%
1964	25.7	4.78%	80.2	4.07%
1965	26.9	4.56%	82.6	2.95%
1966	28.4	5.43%	85.1	2.98%
1967	29.3	3.12%	85.4	0.35%
1968	31.2	6.28%	87.7	2.66%
1969	32.5	4.08%	87.4	-0.34%
1970	33.6	3.33%	87.2	-0.23%
1971	35.9	6.62%	90.0	3.16%
1972	38.5	6.99%	92.6	2.85%
1973	41.9	8.46%	95.3	2.87%
1974	44.1	5.12%	92.1	-3.42%
1975	48.7	9.92%	92.8	0.76%
1976	53.2	8.84%	96.2	3.60%
1977	57.6	7.95%	98.3	2.16%
1978	62.5	8.16%	99.0	0.71%
1979	67.3	7.40%	98.3	-0.71%
1980	71.6	6.19%	96.0	-2.37%
1981	78.2	8.82%	96.3	0.31%
1982	81.2	3.76%	93.3	-3.16%
1983	85.1	4.69%	95.3	2.12%
1984	91.2	6.92%	98.3	3.10%
1985	94.4	3.45%	98.8	0.51%
1986	97.2	2.92%	99.8	1.01%
1987	100.0	2.84%	100.0	0.20%
1988	103.8	3.73%	100.5	0.50%
1989	107.4	3.41%	100.2	-0.30%
1990	111.1	3.39%	100.1	-0.10%
1991	113.0	1.70%	99.1	-1.00%
1992	116.7	3.22%	100.5	1.40%
1993	121.0	3.62%	101.0	0.50%
1994	125.5	3.65%	101.8	0.79%

U.S.multifactor productivity and input inflation extracted
from a file received from Mr. Harper of the Bureau of Labor Statistics
which corresponds to USDL Press Release 95-518, January 17, 1996,
Multifactor Productivity Trends - 1994.

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APR 1 1997

Federal Communications Commission
Office of Secretary

April 1, 1997

Dr. Anthony Bush
Federal Communications Commission
1919 M Street, N. W. Room 614
Washington, D. C. 20554

Dear Dr. Bush:

Attached is a copy of the 1987 Bellcore study titled "Econometric Estimation of the Marginal Operating Cost Interstate Access," as you requested. A copy of this study is being placed on the record in the access reform proceeding, CC Docket No. 96-262.

Respectfully submitted,

Frank G. McKennedy
Director - Legal and Regulatory Affairs

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Bell Communications Research

Special Report
SR-FAD-000552
Issue 1, May 1987

Econometric Estimation of the Marginal Operating Cost of Interstate Access

This document was written by W. Taylor, Division Manager, Economic Analysis Development, and A. Yanez, District Manager, Access Cost Support - Demand Response Methods.

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Prepared by Information Management Services Division,
Bell Communications Research, Inc., May 1987

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Econometric Estimation of the Marginal Operating Cost of Interstate Access

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1.0 OVERVIEW

This study calculates estimates of the marginal costs of interstate switched and special access services that are suitable for use in interstate access tariff filings. Following previous econometric work on telecommunications cost functions,[1] we specify a translog cost function and associated factor share equations to express the relationship between Bell Operating Telephone Companies' (BOCs)[2] costs and the quantity of interstate services they provide. To estimate the parameters of an *access* cost function, data on interstate access costs is required. This poses a significant difficulty since access has been provided as a separate service only since divestiture in 1984.

To overcome this difficulty, we assume that the change in predivestiture total (unseparated) costs and revenues for the BOCs associated with a change in interstate demand is approximately equal to the marginal cost of interstate access today. This would be a good approximation if the BOC facilities used for interstate service in the past remained with the BOC at divestiture and if changes since 1982 in technology and factor prices were small. In any case, the marginal cost estimated in this study is the change in total cost for predivestiture BOCs associated with changes in the volumes of their interstate services.

The major findings of the study are that in 1982, the last year for which complete pre divestiture data could be obtained:

(1) BOCs incurred approximately $0.0515 in additional cost for each additional interstate switched conversation minute.

(2) BOCs incurred approximately $0.2529 in additional cost for each additional dollar of interstate switched services revenue.

(3) BOCs incurred approximately $0.2068 in additional cost for each additional dollar of interstate private line revenue.

The implications of these results, their limitations, and their use in interstate access tariff filings are explored in the study.

Section 2 of this study outlines the historical background of the study and explains why such a study is necessary and where it fits into the access tariff filing process. Section 3 explains the model: its theoretical foundations, data requirements, estimation techniques, and the statistical interpretation of the results. It concludes with a discussion of the assumptions made in the course of estimating the model and an exploration of the sensitivity of the results to small variations in the assumptions. Section 4 explores the data required to estimate the model, providing in detail the sources of the raw data in telephone company books and the calculations required to transform the raw data into the data used to estimate the model. Section 5 applies the *results* of the model estimation to the problem of calculating test year marginal costs for interstate access services. Finally, Section 6 summarizes the study and its uses for interstate access tariff filings and for other uses in which knowledge of the marginal cost of a service is required.

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1. L. R. Christensen, D. C. Christensen, and P. E. Schorch, "Econometric Estimation of Scale Economies in Telecommunications," *Economic Analysis of Telecommunications: Theory and Applications*, ed. L. Courville, A. deFonteney, and R. Dobell (New York: North Holland Publishing Company, 1983), or M. I. Nadiri and M. A. Schankerman, "The Structure of Production, Technological Change and the Rate of Growth of Total Factor Productivity in the Bell System," *Productivity Measurement in Regulated Industries*, ed. T. Cowing and R. Stevenson (New York: Academic Press, 1981).
2. As used here, a "BOC" refers to a divested Bell Operating Company.