

## A Study of Long-distance Rates: Divestiture Revisited

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### 1. Introduction

The break-up of the old Bell System occurred on 1 January 1984 with the divestiture of the local Bell companies from the American Telephone & Telegraph Company (AT&T). One major force that led to divestiture was government policy to stimulate competition in the provision of long-distance service. The tenth anniversary of divestiture is thus an opportune time to explore the effects of divestiture and competition on long-distance rates. Such an exploration is also timely because of recent pressures to stimulate competition in the provision of toll service within the local jurisdictions of the Bell companies.

The methodology used in this study is an examination of the long-term trends in the nearly 80-year history of AT&T long-distance rates and the factors most likely to be influencing these trends. This methodology places the more recent effects of competition and divestiture in a historical perspective. In this way it can be determined whether competition and divestiture had any real effect on the overall patterns of the rate history.

If there were any hypothesis behind the break-up of the Bell System it was that competition and divestiture would cause a decrease in long-distance rates, thereby benefiting consumers. A debate has started over whether any real price competition has occurred in the long-distance market. In a 1992 talk Robert E. Allen, Chairman of AT&T, claimed that competition in the long-distance market "delivered what competition is supposed to deliver: lower prices."<sup>1</sup> A recent paper by William E. Taylor and Lester D. Taylor concludes "that the overall reduction in interstate long-distance prices and expansion of interstate demand is more than explained by the reduction in carrier access charges paid by the long-distance companies to the local telephone companies."<sup>2</sup> As would be expected, AT&T claims that the price competition has indeed occurred, and at least one study asserts that "the long-distance industry is highly competitive, and it will remain so."<sup>3</sup> Another study finds: "The active competition made possible by divestiture in 1984 rapidly drove prices downward."<sup>4</sup> Meanwhile the local Bell companies claim the opposite and accuse AT&T of conspiracy with its competitors. How does one discover the truth in these conflicting claims and statements?

### 2. Rate histories

The long-distance rates for a three-minute telephone call between New York City and Los Angeles carried over AT&T's network were determined from historical data compiled by the Federal Communications Commission (FCC) and AT&T.<sup>5</sup> The yearly rates from 1915 to 1993 are plotted in Figure 1 in each year's dollars. Corrections for inflation were not used

Figure 1: Yearly Rates for a Three-Minute Station-to-Station Telephone Call between New York City and Los Angeles during the day using AT&T

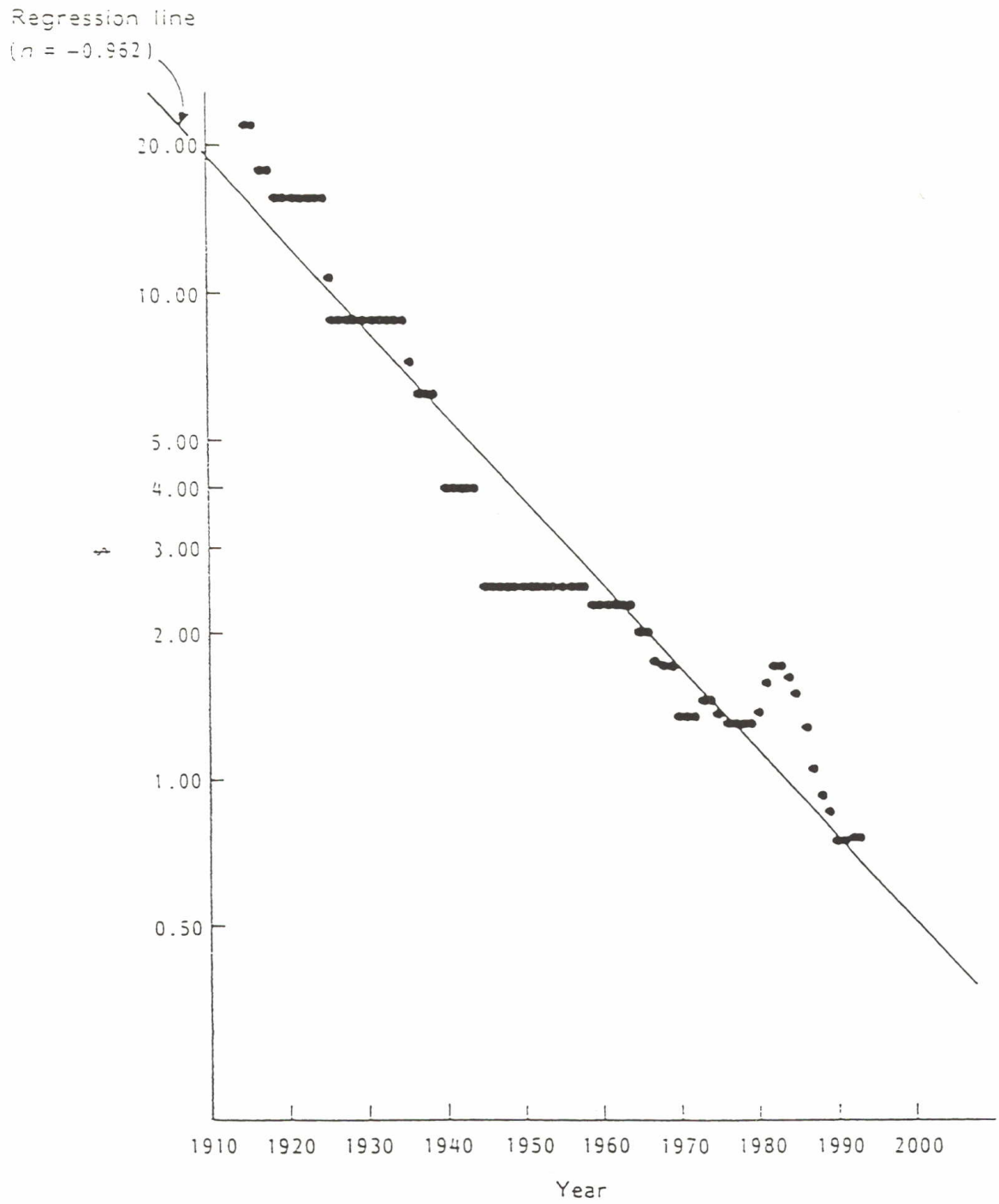
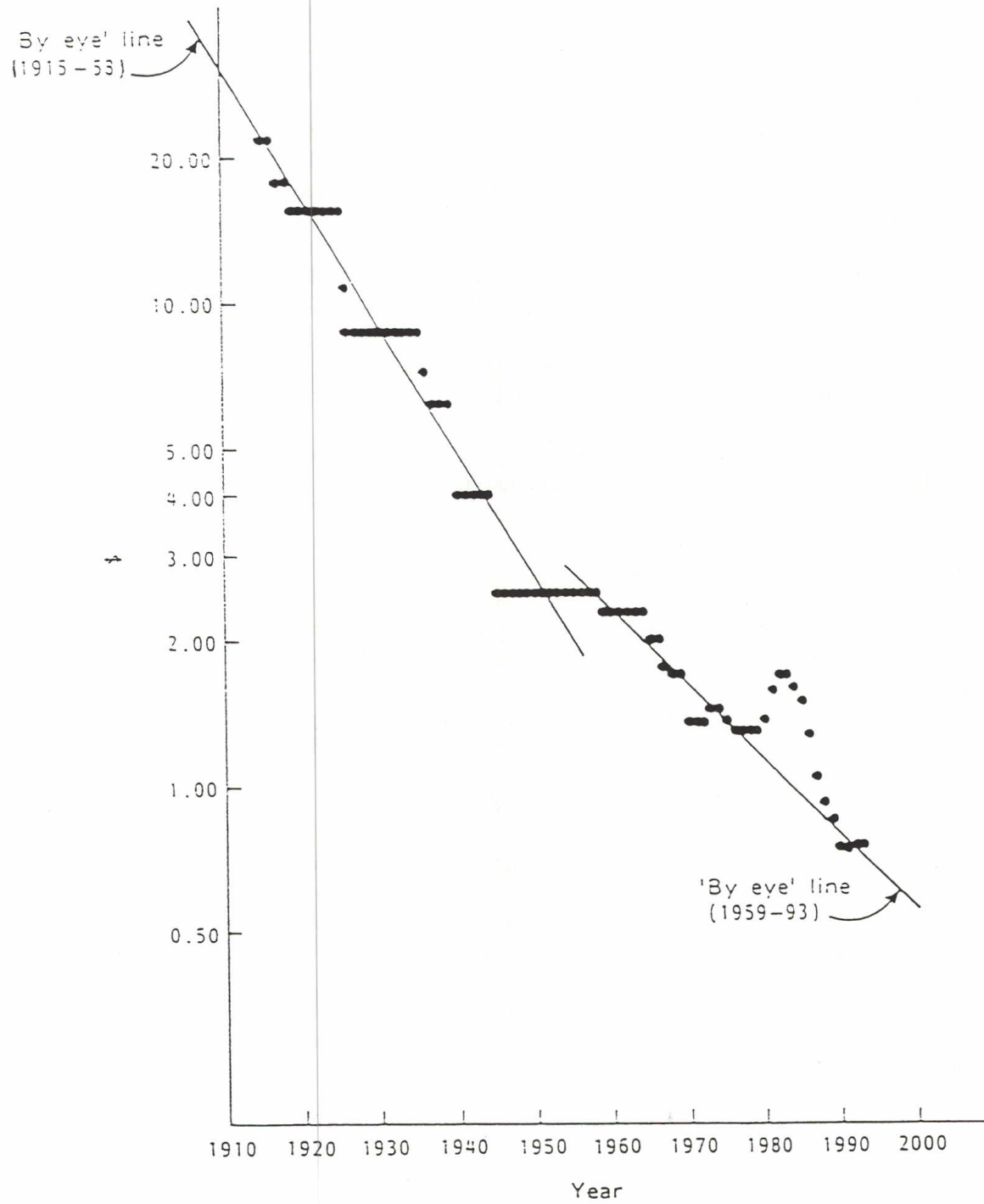


Figure 2: The Data in Figure 1 Fitted 'by eye'  
using two Lines: one for 1915-1958  
and another for 1959-1993



since inflation would simply make the decreases over time even more dramatic and would also mask yearly rate changes.

All graphs of rates presented here plot them along the ordinate on a logarithmic scale. Such a log scale is appropriate since telephone rates usually decrease exponentially with time. Exponential curves appear as straight lines on a log scale.

As expected, the 80-year history plotted in Figure 1 is nearly linear, except for certain periods that are discussed below. A regression analysis was performed using an exponential model, and the regression line covering the full 80-year period is shown. The correlation coefficient for this regression is -0.962. One exception to the overall pattern of ever-decreasing rates is the rise in rates that occurred in the early 1980s. One possible reason for this rise might be a delayed response to the period of strong inflation during the preceding years. Another possible explanation was AT&T's concern over the financial uncertainties of the divestiture that was about to happen in 1984. This rise, whatever the reason, was followed by sharp decreases, and by 1990 the rates were back on the long-term regression line.

The rate history shows lengthy periods when rates were flat. The longest span was immediately after the second world war, from 1945 to 1959. It was during this period that the federal government first instituted the policy of using the profits from long-distance service to subsidize local rates.<sup>6</sup> This was also a time of great technological innovation in the provision of long-distance service, with the introduction of coaxial cable, microwave radio and transistors. But more about technology later.

If the plot of Figure 1 is examined 'by eye', it seems that the period from 1915 to 1958 could be fitted by one straight line and the period from 1959 to 1993 by a second straight line with a flatter slope. Such 'by eye' lines are shown in Figure 2. The implication of two such lines with different slopes is that long-distance rates in the distant past were decreasing more quickly than in the more recent past.

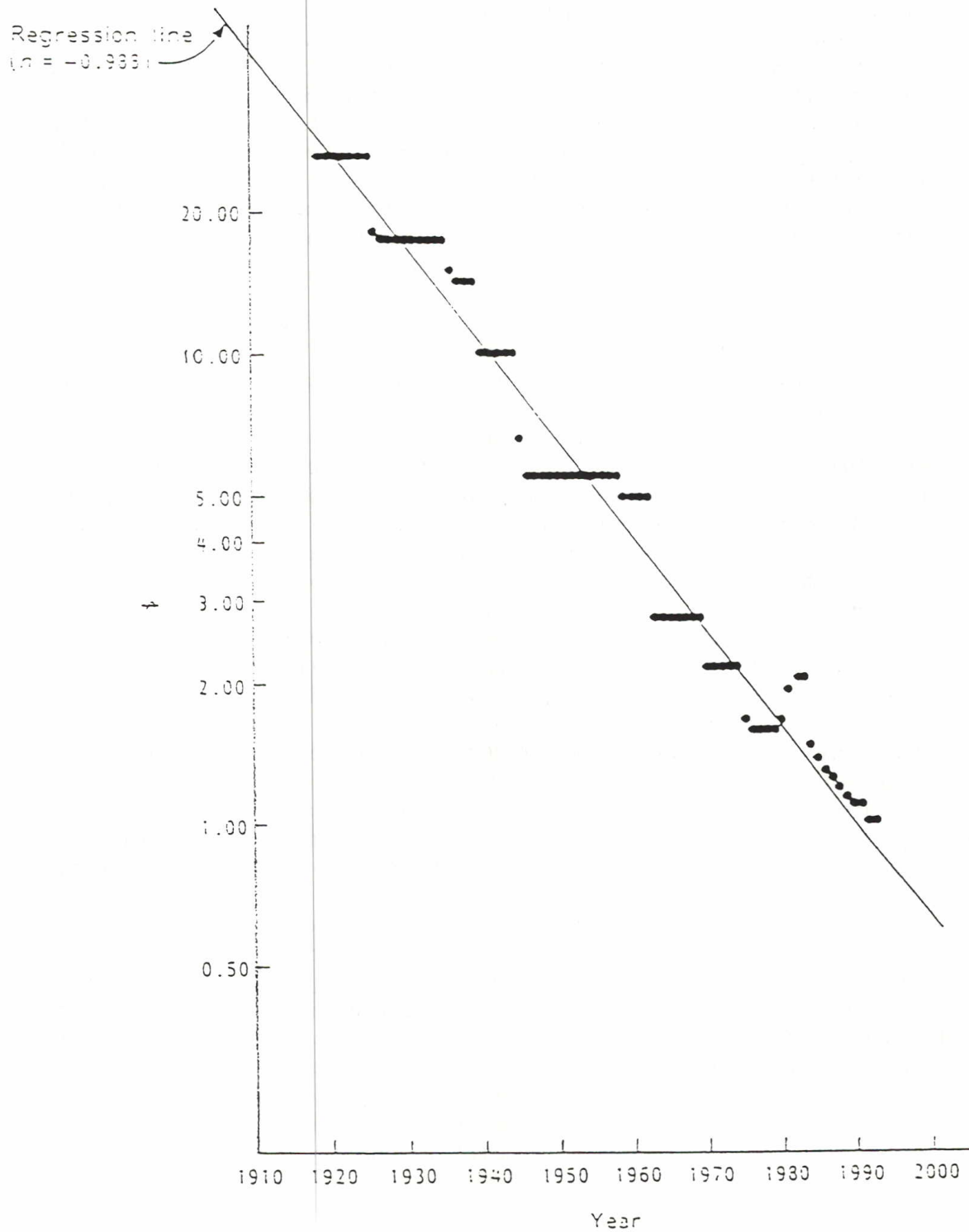
Since the day rate for long-distance service is the highest rate, it can be viewed as a 'list price' charged to most customers but not to larger purchasers, particularly with the advent of competition. For this reason it was decided to examine AT&T's lowest rates. Figure 3 shows the lowest long-distance rate for a long-distance call between New York City and Los Angeles from 1919 to 1993. This plot is very nearly linear, and the straight line fit to the data from a regression analysis is shown. The correlation coefficient for this regression is -0.988.

### 3. Effects of competition

It is clear from Figures 1-3 that long-distance rates have been decreasing nearly exponentially over the last 80 years or so. Neither divestiture nor competition appears to have stimulated any change in this long-term pattern. If anything, divestiture resulted in an initial short-term increase in rates that a few years later was followed by reductions that brought the trend back to the long-term rate of decrease.

The factor that has caused this dramatic history of rate reductions is technological innovation and the resulting increases in productivity, coupled with ever-increasing market demand. The next section reviews these advances in technology.

Figure 3: Yearly Rates for the Lowest-Rate, 10-minute, Station-to-Station Telephone Call between New York City and Los Angeles using AT&T



#### 4. Advances in Technology

Advances in technology have clearly had a dramatic effect on long-distance rates throughout the history of long-distance telephone service.<sup>7</sup> The audion tube, which was invented around 1906, was first used in 1915 for the amplification of telephone signals along the great distances of transcontinental telephone routes. The first commercial use of multiplex technology occurred in 1918 when four telephone signals were combined together through frequency-division multiplexing on pairs of open wire. In the late 1930s multipair cable was used for transcontinental routes with 12 voice circuits being multiplexed over each pair. Repeater technology also progressed so that less costly repeaters could be spaced more frequently, thereby enabling the use of more bandwidth to multiplex more circuits. Negative feedback, invented in 1927, was first used in transcontinental telephone routes in the early 1930s and greatly improved the quality of the vacuum tube amplifiers used in repeaters.

The first coaxial cable system, L1, was placed in service in 1946, consisted of four pairs of coaxials and had a total capacity of 1800 two-way voice circuits. The vacuum tube repeaters were later replaced with transistors in the L4 system, which was placed in service in 1967 and carried 32,400 two-way voice circuits over 11 pairs of coaxials. The last coaxial system, L5, first saw service in 1978, carried 132,000 two-way voice circuits and used integrated circuits in its repeaters.

The first transcontinental microwave radio system was placed in service in 1950 and carried 2400 two-way voice circuits. The horn antenna, first used in the late 1950s, allowed the simultaneous use of both the 4 GHz and 6 GHz bands for a total capacity of 16,800 two-way voice circuits. The AR6A microwave system combined with the TD system gave a total route capacity of 61,800 two-way voice circuits. Communication satellites located in geosynchronous orbits above the Earth's equator were first used to carry telephone calls in the mid-1970s.

Today's transmission medium with the greatest capacity is optical fibre. A single strand of fibre today carries 2 gigabits, which is equivalent to over 30,000 telephone circuits. A typical fibre transmission system across the country will have dozens of fibre strands in a single cable. As the optical fibre itself improves, the need for detecting and regenerating digital signals along the way becomes less frequent. Regenerative repeaters are being implemented as optically active portions of the fibre which use light amplification to boost the digital signals. Today's way to combine telephone signals to share a transmission medium such as optical fibre is to convert each signal to a digital format and then combine the digital signals in time (time-division multiplexing). Modern switching machines switch these digital signals directly.

The manner in which telephone circuits are connected and created across long distance has likewise progressed greatly because of technological innovations. In the earliest days of telephone service, human operators connected the circuits along the way to create the path needed for a long-distance call. Automated electro-mechanical switching was first used in the Bell system in 1919 on a local level. This technology was later used on long-distance circuits thereby reducing the need for a large number of human operators to connect circuits across the continent for long-distance calls. Direct distance dialing (DDD) was first offered in the early 1950s, thereby eliminating entirely the need for human operators to set up long-distance calls.

Automation has had much impact on the tasks performed by human operators. Speech synthesis handles standardized instructions to telephone callers. Speech recognition is now

ing used to eliminate further the need for intervention by human operators, thereby leading to improvements in operator productivity.

This 80-year progression of technology is an exciting story. The price of long-distance service has declined continuously, while simultaneously quality has increased steadily. The provision of long-distance service is a wonderful success story - thanks to technology.

### 5. Costs of Competition

One would expect that competition would increase the costs of sales and advertising. Figure 4 shows AT&T's expenses for sales and advertising applicable to long-distance services from 1970 to 1992. The data come from AT&T's reports to the Federal Communications Commission on FCC Report Form M. Although these expenses were increasing from 1970 to 1983, a large jump occurred in 1984 followed by a sharp rise in the rate of increase.

AT&T's advertising and sales expenses were about \$2.1 billion in 1992 compared to only about \$0.25 billion 10 years earlier in 1982. It is interesting to state these expenses as a percentage of long-distance revenues. The actual revenues as reported to the FCC on Form M are shown in Figure 5. The revenues before divestiture in 1984 were net of separations (or today's access charges). The large increase that occurred in 1984 was the result of the inclusion of access charges and also because AT&T assumed all the inter-LATA toll traffic previously carried by the local Bell companies. Figure 6 shows the advertising and sales expenses as a percentage of long-distance revenue from 1970 to 1992. The percentage increased from 1970 to 1983, when it reached a maximum of about 6%. With the great increase in long-distance revenue that occurred in 1984, the percentage dropped to early 1970 levels of a little more than 2%. This was followed by sharp increases until a level of about 6% was again reached in 1992.

The conclusion from these data is that competition is costly to AT&T in terms of the expenses of advertising and sales.

A second dimension of competition in long-distance service is the cost of access charges paid by AT&T to the local telephone companies. In 1984 the access charges paid by AT&T were \$20,633 million, or 56.7% of telecommunication service revenues of \$36,414 million, and advertising and sales expenses for telecommunication services were \$776 million. In 1992 access charges paid by AT&T had decreased to \$18,132 million, or 45.8% of telecommunication service revenues of \$39,580 million, and advertising and sales expenses for telecommunication services had increased to \$2111 million.

Thus from 1984 to 1992 access charges decreased by \$2501 million but advertising and sales expenses increased by \$1334 million, thereby offsetting a little more than half of the savings in decreased access charges. Since the rate of decrease in the lowest long-distance rates remained fairly constant over this period, any net savings from decreases in access charges over increases in the expenses of advertising and sales do not appear to have been passed on to consumers by AT&T. To some extent this confirms the findings of the previously mentioned study by Taylor and Taylor.<sup>8</sup>

The access charge and revenue figures are from AT&T's Annual Reports and the data for advertising and sales expenses are from the Form Ms filed yearly by AT&T with the FCC.

Figure 4: AT&T's Expenses for Sales and Advertising

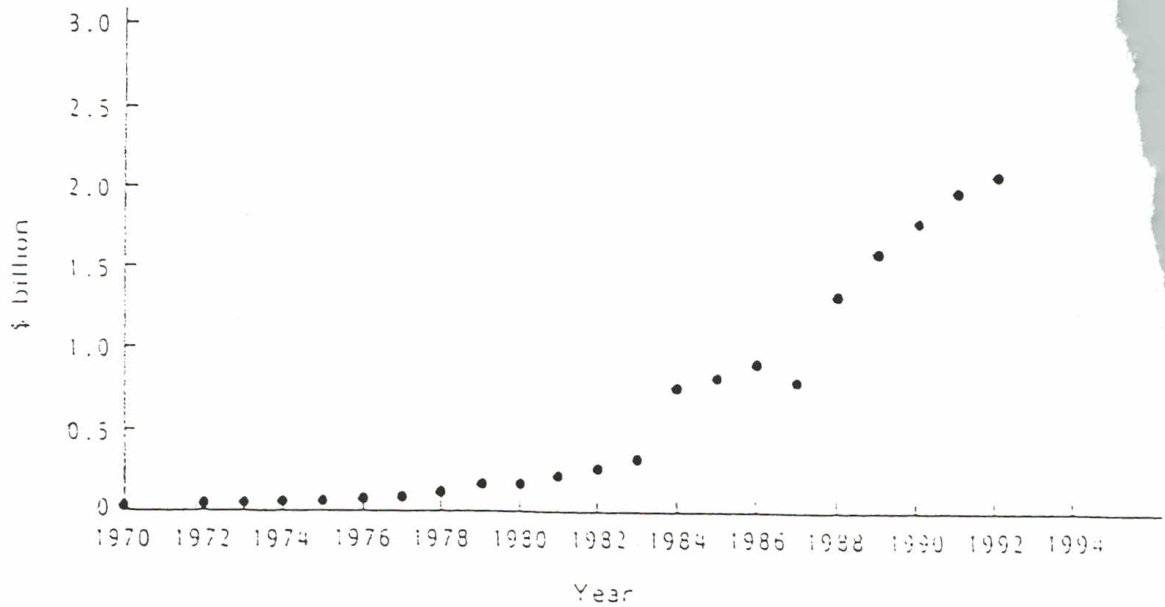
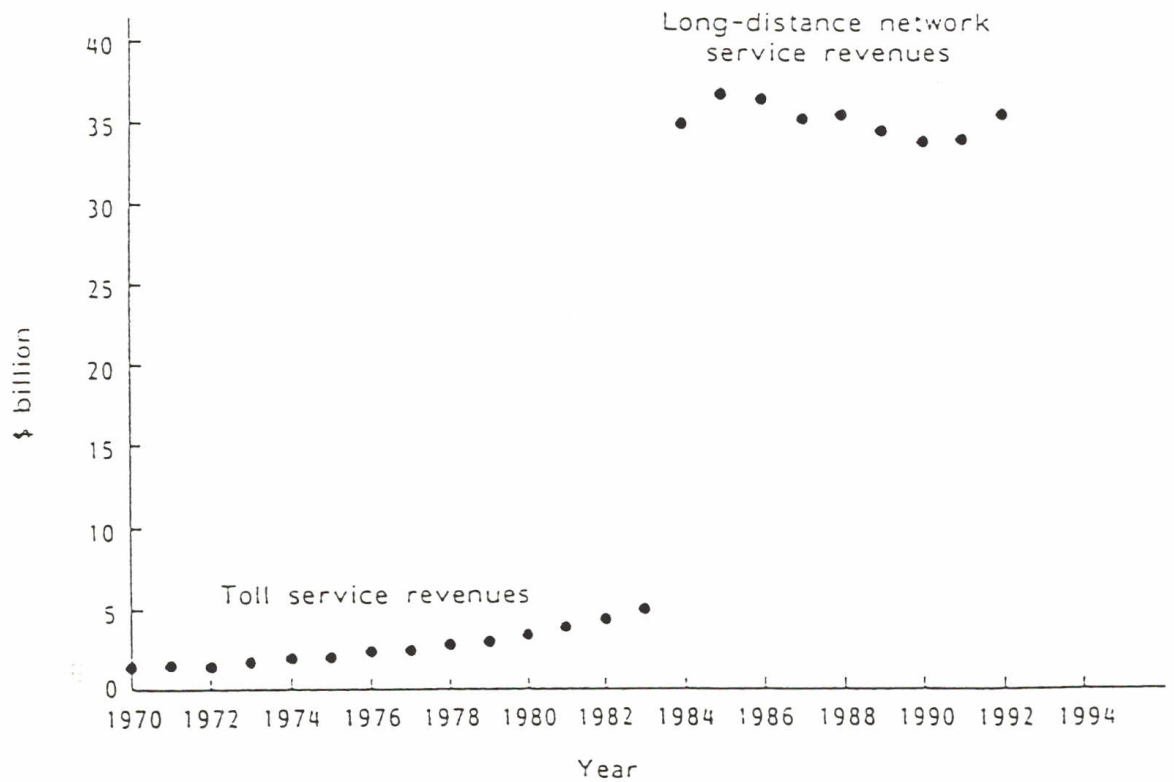


Figure 5: AT&T's Revenues from Long-Distance Service





## 6. Policy Implications

The findings of this study show quite clearly that neither competition nor divestiture has had any real effect on long-distance rates. These rates have been decreasing because of technological innovation and increases in productivity, coupled with increases in market demand. At the same time these same technological innovations have been increasing the quality of long-distance service in terms of reliability (increased call completion rates), clarity (improved frequency response and signal-to-noise ratios) and speed (faster call connections). By all measures, long-distance service continues to be both a great success and a bargain.

The old Bell System, under AT&T's direction, did a great job of providing long-distance service and meeting the needs of the public. At a time when it is in vogue to criticize any form of monopoly, the old Bell monopoly shows that regulation coupled with technological innovation and a sense of public mission can indeed be a force for the good of the public.

The provision of telephone service was viewed for decades as a natural monopoly. It has only been in the last decade or so that the government policy has attempted to stimulate competition in the provision of long-distance service, while at the same time continuing to regulate AT&T but not AT&T's competitors. The history of ever-decreasing long-distance rates over time implies that the model of natural monopoly for long-distance service was perhaps appropriate. It is therefore no surprise that the differences in rates among the various providers of long-distance service are negligible.

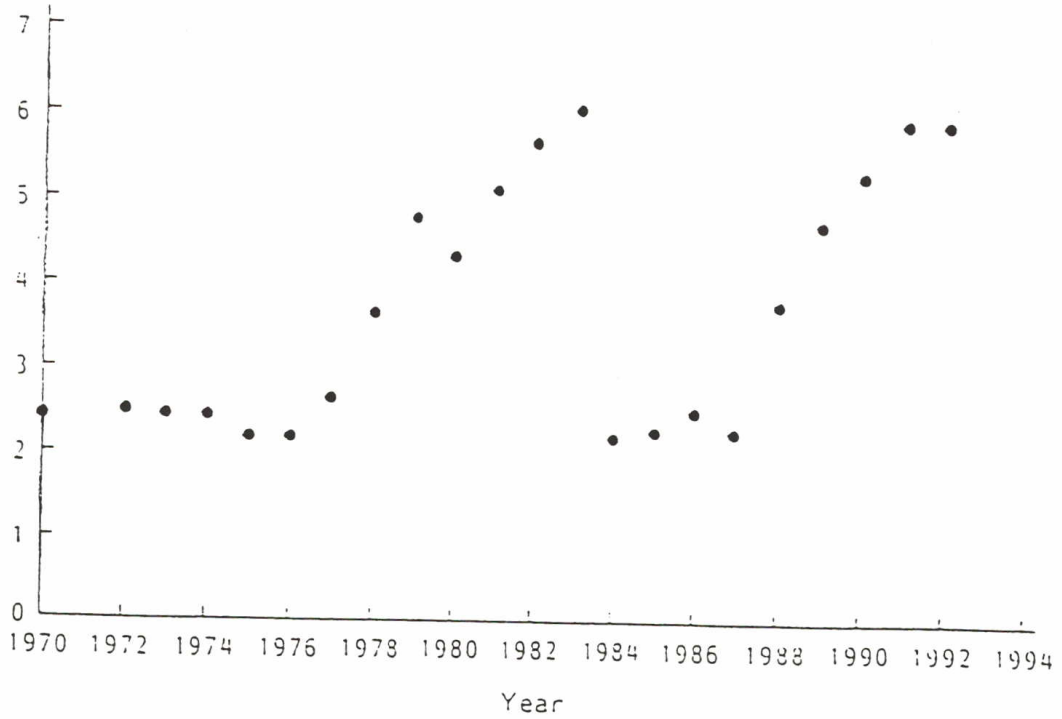
Competition came to telecommunication service in the USA as a result of pressures being applied to the government by companies that realized they could make substantial profits by avoiding the separations (today's access charges) paid to AT&T to subsidize local rates. Now that all long-distance companies pay the same access charges to the local telephone companies, this unfair competitive edge has been eliminated. Today's 'competition' in long distance service is forced and seems to be an artefact that benefits AT&T's competitors but perhaps not the public. Competition between AT&T, MCI, and Sprint is mostly in the invention of advertising and promotional schemes and not in price. In fact the costs of competition from additional sales and advertising expenses might actually be resulting in slightly higher long-distance rates to consumers.

All this implies the need for great caution before extending and promoting competition in the provision of toll service within the local jurisdictions of the local telephone companies. If these toll rates are judged to be excessive, the appropriate local regulatory bodies should seek a reduction, recognizing that rates for basic service will almost certainly increase to offset the loss of revenue. The profits of the local Bell telephone companies need to be examined, since they might be excessive. Such profits will enable the local companies to extend their local monopolies into the provision of entertainment television, either through the acquisition of CATV companies or by rewiring their territories with broadband optical fibre to homes.

Before the mistakes of the past are repeated - namely, the promotion of competition for its own sake - these issues need thorough examination and discussion by the appropriate policy makers at the local and federal levels, along with due consideration of the public's needs and desires.

It is possible that the implementation of long-distance competition in the USA has been deficient in terms of not causing a greater decrease in rates than would have resulted from the normal long-term trend. AT&T is regulated but its competitors are not. AT&T thus has a vested interest in the survival of these competitors and is perhaps reluctant to compete

Figure 6: AT&T's Expenses for Sales and Advertising Plotted as a Percentage of Revenues from Long-Distance Service



vigorously in prices with MCI and Sprint for fear of driving one or both of them from the market.

Countries around the world are considering actions to promote competition in the provision of telecommunication service. They would be wise to assess the effects of competition in the USA before embarking on such a course.

### 7. Future Research

It would be enlightening to examine the long-term trends for some representative telecommunication services to business customers, such as private lines. Similarly, long-term trends in quality of long-distance service need to be examined, such as circuit noise, echo and call completion time. I suspect, however, that these long-term trends will all be decreasing over time and will show no change from either competition or divestiture.

### Endnotes

1. Robert E. Allen, 'Adam Smith and telecommunications,' remarks before the Federal Communications Bar Association, Washington, DC, 3 December 1992.

2. William E. Taylor and Lester D. Taylor, 'Postdivestiture long-distance competition in the United States,' *American Economic Review*, Vol 83, No 2, May 1993, pp 185-190.

3. Michael E. Porter, *Competition in the Long Distance Telecommunications Market: An Industry Structure Analysis*, Monitor Company, Inc, 1990.

4. Robert E. Hall, *Long Distance: Public Benefits From Increased Competition*, Applied Economic Partners: Menlo Park, CA, October 1993.

5. Statistics of Communications Common Carriers, Federal Communications Commission, Washington, DC, 1991/1992 edn, p 259; 'Comparison of major rate changers from 1915 to September 19, 1959,' AT&T Archives.

6. Peter Temin, *The Fall of the Bell System*, Cambridge University Press, Cambridge, UK, 1987, p 20.

7. John R. Pierce and A. Michael Noll, *Signals: The Science of Telecommunications*, Scientific American Library, New York, 1990; A. Michael Noll, *Introduction to Telephones and Telephone Systems*, 2nd edn, Artech House, Boston, MA, 1991.

8. Taylor and Taylor, op cit, Ref 2.