Bell Atlantic

Bell Atlantic Network Services, Inc.
1133 Twentieth Street, N.W.
Suite 810
Washington, DC 20036
202 392-6979

Joseph J. Mulieri
Director – FCC Relations

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Federal Communications Commission
Office of Secretary

Ex Parte

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W. Rm. 222
Washington, D.C. 20554

Re: CC Docket No. 96-262

Today, on behalf of Bell Atlantic, Ed Lowry, Steve Pociask, and I met with Pat DeGraba of the Common Carrier Bureau to discuss the above captioned proceeding. The attached material was discussed during the meeting.

Please enter this letter and the attached material into the record as appropriate. If there are any questions, please do not hesitate to contact me.

Sincerely,

Joseph Mulieri

Attachment

cc: P. DeGraba

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EFFECTS OF LARGE PRICE REDUCTIONS ON TOLL AND CARRIER ACCESS DEMAND

by

Timothy J. Tardiff

National Economic Research Associates
One Main Street
Cambridge, MA 02142

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Abstract

On January 1, 1995, competition for intraLATA toll services began in California. Substantial reductions of 40 percent to 50 percent in toll and carrier access prices (and offsetting increases in basic exchange prices) accompanied the beginning of competition. This rate rebalancing was based on the adoption of a toll elasticity of -0.5 and a carrier access elasticity of -0.44 by the California Public Utilities Commission. These values are considerably higher than the elasticities submitted as evidence by Pacific Bell and GTE.

This paper measures the demand response to competitive entry and the price reductions, based on results from the first full year. The particular questions that are answered include: (1) how much has the market grown as a result of the price decreases; (2) how fast did the demand response occur; and (3) how much market share did the new entrants win. Simple observation of monthly data and the use of a standard diffusion model produce the following answers: (1) the long-run steady state demand response is lower than that anticipated by the Commission's decision and is consistent with the elasticity estimates provided by the telephone companies and (2) both market demand growth and entrants' market share growth occurred rapidly within the first few months.

I. INTRODUCTION

On January 1, 1995, services provided by local exchange carriers (LECs) in California were open to competition.[1] The California Public Utilities Commission decision that ordered increased competition also restructured the LECs' prices concurrently with allowing competition.[2] While a large array of services was subject to repricing, the most important services were basic exchange access, intraLATA toll, and switched carrier access. The basic residential flat rate was increased from $8.35 to $11.25 for Pacific Bell and from $9.75 to $17.25 for GTE-California, toll prices were reduced by about 45 percent, and switched carrier access rates dropped by about 50 percent.

The rate changes were the result of a comprehensive and lengthy regulatory investigation. The general philosophy governing the rate design was "revenue neutrality"—the rate changes should neither increase nor decreases the LECs' net revenues.[3] Of particular importance was the amount of stimulation or repression produced by the price change. IntraLATA toll demand produced the greatest interest and controversy. Economists for the LECs performed demand studies that produced price elasticities for the major services, including toll elasticities in the -0.3 to -0.4 range.[4] Representatives of other parties proposed higher elasticities, based on *intrastate* estimates presented in Lester Taylor's first

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[1] Certain services were not open to competition at this time, including local exchange service. The California Commission is currently conducting several regulatory investigations with the object of open competition in all telecommunications markets by the beginning of 1997.

[2] California Public Utilities Commission, In the Matter of Alternative Regulatory Frameworks for Local Exchange Carriers, D.94-09-065, September 15, 1994. This decision is commonly called the "IRD Decision."

[3] Pacific Bell and GTE-California have been operating under price cap regulation since 1990. The starting prices for price caps were 1989 rates. The revenue neutrality determination in the subsequent rate design investigation was in terms of 1989 prices and volumes, i.e., the rates that would have been chosen had rate changes been in place at the beginning of price caps.

[4] The toll elasticities are described in Gregory M. Duncan and Donald M. Perry, "IntraLATA Toll Demand Modeling: A Dynamic Analysis of Revenue and Usage Data," *Information Economics and Policy*, Vol. 6, No. 2, 1994, pp. 163-178. Pacific Bell's demand analysis for basic residential exchange services is described in Jerry Hausman, Timothy Tardiff, and Alexander Belinfante, "The Effects of the Breakup of AT&T on Telephone Penetration in the United States," *American Economic Review*, Vol. 83, No.2, 1993, pp. 178-184.

telecommunications demand book[5] or the elasticity of demand for *interstate* toll service, which is about -0.7.[6] The Commission's decision adopted an elasticity of -0.5 for intraLATA toll.

Proponents of the larger elasticities argued that the experience in other jurisdictions was readily transferable to intraLATA toll calling. The crux of the argument was whether the magnitude of the price response increases with the length-of-haul of the call. Even though the advocates of transferring elasticities for long-haul calling relied on Professor Taylor's previous research, he strongly asserted that elasticity increases (in magnitude) with the length-of-haul, thus invalidating the proposed use of the elasticities from different contexts.

Another major issue was the functional form for applying the elasticity: constant (log-log) or linear. GTE-California's model had a constant elasticity specification and Pacific Bell's was linear. The California Commission adopted the constant elasticity function for both companies.

The functional form issue was much more than merely academic. With the large price changes ordered by the Commission, the constant elasticity specification produces a much greater demand stimulation than does the linear model (for the same elasticity estimate). At the 45 percent price decrease ordered by the Commission, the constant elasticity model produces demand stimulation of 35 percent and a revenue reduction of 26 percent. In contrast, the linear model produces demand stimulation of 22.5 percent and a revenue reduction of 33 percent. In turn, application of the constant elasticity model requires smaller price increases in other services to meet the revenue-neutrality objective.

The remainder of this paper describes the result of the first full year after the January 1995 price changes. The major conclusion is that results to date are much closer to what the LECs' models predicted than they are to the Commission's expectations, let alone to the predictions of the proponents of even higher elasticities.

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[5] Lester D. Taylor, *Telecommunications Demand: A Survey and Critique*, Cambridge: Ballinger, 1980.

[6] Joseph P. Garto, Jerry Langin-Hooper, Paul B. Robinson, and Holly Tyan, "Interstate Switched Access Demand Analysis, *Information Economics and Policy*, Vol. 3, No. 4, 1988, pp. 333-358.

II. DEMAND STIMULATION FROM 1995 INTRALATA TOLL PRICE REDUCTIONS[7]

A. Predicted Outcomes

For purposes of revenue-neutral rate rebalancing, the IRD Decision assumed the following:

- That the stimulation in toll volumes resulting from the IRD toll price reductions would be consistent with an elasticity of -0.5, applied with a nonlinear demand curve.
- That Pacific would realize the full amount of this stimulation, i.e., it would maintain its Pre-IRD 100% market share.
- That the volume stimulation would happen immediately.

The IRD Decision reduced toll revenues by about $748 million from the 1989 revenue base of $2.208 billion. However, since a surcredit of about 11.4 percent was applied to pre-IRD toll bills, the effective revenue base was about $1.96 billion (2.21 x (1 - 0.114)). Therefore, the expected reduction in post-IRD revenues is about 25 percent of the effective base of pre-IRD revenues including stimulation.[8]

The average price reduction ordered by the IRD decision can be calculated from the 25 percent revenue reduction ordered by the decision and a nonlinear demand model with an elasticity of -0.5.[9] The average price reduction is computed as follows[10]:

$$\frac{New\ Price}{Old\ Price} = \left(\frac{New\ Revenue}{Old\ Revenue}\right)^{\frac{1}{1+e}}$$

where e is the elasticity. Inserting the numerical values,

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[7] These results are based upon work performed by Pacific Bell reported in Declaration of Dr. Timothy J. Tardiff and Professor Lester D. Taylor, Exhibit B of Joint Petition of Pacific Bell and GTE California for Modification of D.94-09-065, August 28, 1995 and a subsequent update described in Declaration of Dr. Timothy J. Tardiff, January 19, 1996.

[8] Post-IRD revenues of $1.46 billion ($2.21 billion - $0.75 billion) are 75 percent of the effective pre-IRD revenue base of $1.96 billion. Thus the reduction in revenue is about 25 percent.

[9] If data were available, pre- and post-IRD price indices could be calculated and the price change could be computed directly. The actual rate design was very complicated, with rate reductions varying by rate element, the introduction of new discount plans, and the like. Thus, the approach based on expected revenue reductions produces a practical indirect estimate of the average price reduction.

[10] The formula follows from (1) the fact that the revenue elasticity is (1 + e) for a constant elasticity model and (2) inverting the revenue function to solve for price.

$$\frac{New\ Price}{Old\ Price} = \left(\frac{2.208B - 748M}{1.96B}\right)^{\left(\frac{1}{1 - -0.5}\right)} = 0.56$$

This formula produces an average price reduction of about 44 percent, because the new price is 56 percent of the old price.

The volume stimulation (in minutes) produced by a 44 percent average price reduction and a nonlinear demand curve can be derived from the following formula:

$$\frac{New\ Volume}{Old\ Volume} = \left(\frac{New\ Price}{Old\ Price}\right)^{e}$$

Inserting the numerical values,

$$\frac{New\ Volume}{Old\ Volume} = (1 - 0.44)^{-0.5} = 1.34$$

Thus, volume stimulation supposed by IRD is 34 percent.

In contrast, Pacific's elasticity study, produced by Professor Jerry Hausman, predicts much less stimulation from a 44 percent price decrease. The Hausman study produced an average elasticity of -0.28, applied as a linear model.[11] With a linear model, the stimulation follows from the familiar formula:

$$Stimulation = Percent\ price\ change \times e$$

Using a 44 percent price change,

$$Stimulation = -0.44 \times -0.28 = 0.125$$

produces a stimulation of 12.5 percent under the Hausman model. In terms of revenues, IRD predicts that Pacific will experience $370 million in increased revenues, based on the 1989 revenue base. This

[11] This elasticity represents a weighted average of Hausman's separately calculated business MTS, WATS, and residence MTS elasticities, as well as elasticities for OPH, coin, and calling card services. The weighted average was calculated as follows: $e = \sum w_i e_i$, where the w's are revenue weights and the e's are the service-specific elasticities. Separate elasticities were calculated for (1) business outbound toll services (MTS and WATS); (2) residence toll; and (3) other toll services (coin, operator-handled, and calling card).

is about $234 million more than the Hausman model predicts, where in both cases, no competitive losses are considered.

The elasticity from the linear Hausman model can be converted into an equivalent elasticity that can be used with the nonlinear demand curve adopted in IRD Decision. The equivalent elasticity is found by solving for the value of e that produces 12.5 percent volume stimulation from a 44 percent price decrease, using the nonlinear demand curve. Specifically,

$$\frac{New\ Volume}{Old\ Volume} = \left(\frac{New\ Price}{Old\ Price}\right)^{e}$$

Solving for e produces the following:

$$e = \frac{\mathrm{LN}\left(\frac{New\ Volume}{Old\ Volume}\right)}{\mathrm{LN}\left(\frac{New\ Price}{Old\ Price}\right)}$$

$$= \frac{\mathrm{LN}(1.125)}{\mathrm{LN}(1 - 0.44)} = -0.20$$

That is, an elasticity of -0.20, applied with a nonlinear demand model gives the same 12.5 percent volume stimulation from a 44 percent price reduction as does Professor Hausman's model.

B. First Year Results

On January 1, 1995, the toll prices ordered by the IRD decision took effect and competing carriers started offering intraLATA toll services. The results through December 1995 are shown in Table 1.

Table 1: Post-IRD Toll Market Results

Month	IXC Share	Pacific Growth	Market Growth
January 1995	3.0%	3.7%	6.9%
February 1995	4.1%	1.9%	6.3%
March 1995	5.0%	4.8%	10.3%
April 1995	5.3%	2.9%	8.7%
May 1995	5.5%	6.4%	12.5%
June 1995	5.5%	5.9%	12.1%
July 1995	5.4%	7.4%	13.5%
August 1995	5.5%	7.6%	13.9%
September 1995	5.6%	5.9%	12.2%
October 1995	5.7%	9.6%	16.2%
November 1995	6.0%	8.6%	15.6%
December 1995	6.1%	6.9%	13.9%

The first column shows IXC growth in intraLATA toll share since IRD went into effect. These figures are based on IXC 10XXX call volumes, which are recorded by Pacific's billing system. The second column shows Pacific's toll volume growth, compared to the same month of the prior year. These data are thus adjusted for seasonal variations. The third column shows toll growth for the entire industry, compared to the same month of the prior year.

Table 1 shows the total market growth (Pacific plus IXCs) has reached as high as 16.2 percent over the previous year. This figure must be adjusted to arrive at the IRD price stimulation factor, because the growth rates shown in Table 1 include the effects of all growth-inducing factors, e.g., population growth, growth in the economy, etc., in addition to the IRD price change. A conservative estimate of the effect of these other factors is given by the average annual toll volume growth rate for the 1990s of about 2 percent.[12] Removing this

[12] Apart from moderate changes in the surcredit, intraLATA toll prices were virtually constant over this time period. Therefore, the average growth rate serves as a proxy for non-price effects.

"business as usual" growth from the 1995 growth produces a maximum adjusted growth rate of about 14.2 percent (October) and average for the last sixth months of 12.2 percent.

A comparison of the 1995 results with what was anticipated by the IRD decision also requires an assessment of how far along customers are in adjusting to lower toll rates, i.e., whether the current market growth rate is at the long-run (or steady-state) outcome. The data in Table 1 show a pattern of immediate market growth that appears to have leveled off quite quickly. Thus, the average 12.2 percent growth due to price reductions for the last sixth months is likely to be close to the ultimate steady-state growth.

A typical diffusion model is used to determine whether current results are close to the steady state.[13] A diffusion model has the following equation.

$$Growth\ Rate_t = \frac{K}{(1 + e^{-bt})}$$

where "K" is the estimate of the steady state growth rate and "t" is the number of months into the post-IRD era. Nonlinear least-squares applied to the data in Table 1 (adjusted to remove "business-as-usual growth"), produces a steady state growth ("K") of about 12.8 percent which is only slightly higher than the 12.2 percent adjusted average growth rate for the last half of 1995.

In summary, the results to date are close to the long-run outcome expected from Professor Hausman's analysis, and appear to be close to the steady-state. Thus, the 34 percent market stimulation anticipated by the IRD decision now appears very unlikely and overstates Professor Hausman's and my current estimate of the steady-state by a multiple of about 3.

C. Competitive Losses

Table 1 also shows that the IXCs attained an immediate market share of 3 percent, which has since climbed to 6 percent. In contrast, during 1985, the first full year in which any appreciable amount of equal access was available, AT&T lost only 3 percent of its interstate

[13] Professor Jerry Hausman estimated a more complex diffusion model, using a longer time series and corrections for autocorrelation. His estimates of the steady state demand and the diffusion rate (K and b) were almost identical to the results obtained from the simpler specification reported here.

market share. Under the conservative assumption that that share has leveled off at about 6 percent for the foreseeable future, the revenue shortfall is at least $73 million (based on 1989 base volumes, adjusted for demand stimulation).

III. DEMAND STIMULATION FROM 1995 SWITCHED ACCESS PRICE REDUCTIONS

A. Predicted Outcomes

The IRD Decision reduced switched access revenues by about $167 million and eliminated the carrier common line (CCL) charge, which reduced revenues by an additional $189 million from the 1989 revenue base of $677 million (including CCL revenues). However, since a surcredit of about 31.9 percent was applied to pre-IRD carrier access bills, the effective revenue base was about $461 million (677 x (1 - 0.319)). Therefore, the expected reduction in post-IRD revenues is about 30 percent of the effective base of pre-IRD revenues including stimulation.

A reasonable approximation of the price change that can be inferred from the 30 percent revenue reduction is obtained by inserting the numerical values into the formula for the new price we previously used (and using the adopted switched access elasticity of -0.44):

$$\frac{New\ Price}{Old\ Price} = \left(\frac{677M - 167M - 189M}{461M}\right)^{\left(\frac{1}{1 + -0.44}\right)} = 0.52$$

Thus formula produces a price reduction of about 48 percent, because the new price is 52 percent of the old price.

The volume stimulation (in minutes) produced by a 48 percent average price reduction is given by the formula for the nonlinear demand curve with an elasticity of -0.44.
Inserting the numerical values,

$$\frac{New\ Volume}{Old\ Volume} = (1 - 0.48)^{-0.44} = 1.33$$

Thus, volume stimulation supposed by IRD is 33 percent.

In contrast, Professor Hausman's switched access elasticity study predicts much less stimulation from a 48 percent price decrease. The Hausman study produced an elasticity compatible with the Decision's nonlinear demand curve of -0.16. The stimulation that results from a 48 percent price reduction is the following:

$$Stimulation = \frac{New\ Volume}{Old\ Volume} - 1 = (1 - 0.48)^{-0.16} - 1 = 0.11$$

That is, the Hausman model produces a stimulation of 11 percent. In terms of revenues, IRD predicts that Pacific will experience $80 million in stimulation, based on the 1989 revenue base. This is $53 million more than the Hausman model predicts, where in both cases, no competitive losses are considered.

B. First Year Results

On January 1, 1995, the switched access prices ordered by the IRD decision took effect. The results through December 1995 are shown in Table 2.

Table 2: Post-IRD Switched Access Results

Month	Volume Growth
January 1995	10.5%
February 1995	6.8%
March 1995	12.6%
April 1995	14.0%
May 1995	12.9%
June 1995	14.0%
July 1995	18.9%
August 1995	10.3%
September 1995	17.2%
October 1995	10.2%
November 1995	17.1%
December 1995	12.5%

Table 2 show Pacific's intrastate switched access volume growth (exclusive of the volumes associated with the 10XXX intraLATA minutes considered earlier), compared to the same month of the prior year, thus removing the effects of seasonal variations.[14]

Table 2 shows volume rapidly grew by over 10 percent by March and has fluctuated around the average of 14 percent for the last 10 months. The growth reached as high as 19 percent (July) over the previous year. These figures must be adjusted to arrive at the IRD price stimulation factor, because the growth rates shown in Table 2 include the effects of all growth-inducing factors, e.g., population growth, growth in the economy, etc., in addition to the IRD price change. An estimate of the effect of these other factors is given by the average volume growth for intrastate access from 1993 to 1994 (prices were virtually constant from 1992 through 1994) was about 6 percent. Removing this "business as usual" growth from the 1995

[14] The 10XXX volumes are excluded because (1) growth should be measured over common services (intra-state interLATA) and (2) these volumes are already included in the analysis of intraLATA toll.

growth produces an adjusted average growth rate (due to the price decrease) of about 8 percent for the last 10 months and a maximum rate of 13 percent for July 1995.

A comparison of the 1995 results with what was anticipated by the IRD decision requires an assessment of how far along customers are in adjusting to lower toll rates, i.e., whether the current market growth rate is at the long-run (or steady-state) outcome. Again, a diffusion model, estimated with nonlinear least squares, is used to estimate the ultimate steady-state growth indicated by the data in Table 2. The steady state growth ("K") is about 8.5.

In summary, switched access demand growth appears to be close to the steady state. Indeed, the maximum year-over-year growth occurred in July, with growth for the later months somewhat lower. The results show that if anything, Professor Hausman's long-run steady state of 11 percent is higher than the 8.5 percent stimulation implied by 1995 data. Thus, the 33 percent market stimulation anticipated by the IRD decision now appears very unlikely and overstates stimulation by a multiple of more than 3.

IV. SUMMARY

This evaluation of the post-IRD intraLATA toll market strongly suggests that the long-run price response of California's consumers is much closer to what Pacific proposed than what was adopted in the IRD decision.

On the 1989 revenue base, the annual toll revenue shortfall from the incorrect IRD elasticity and from the disregard of market share losses is as follows.

- Elasticity impact: $234 million
- Market share impact: $73 million
- Total: $300 million

In addition, only about one-third of the switched access demand stimulation anticipated by the IRD decision now seems likely. Thus, the $80 million anticipated by this stimulation is too large by about $53 million (2/3 x 80). Finally, the IRD decision included $109.2 million of increased costs ("implementation costs") associated with the increases in toll and switched access volumes (D.94-09-065, p. 170). Because actual stimulation appears to be about only one-third as large (for both toll and switched access) as the amount anticipated in the decision, the implementation costs should be reduced proportionately to $36.4 million. That is, implementation costs are likely to be $72.8 million less that the amount adopted in the IRD decision.