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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

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In the Matter of	)	
	)	
Price Cap Performance Review for Local Exchange Carriers	)	CC Docket No. 94-1
	)	
	)	
Access Charge Reform	)	CC Docket No. 96-262

COMMENTS OF THE INDEPENDENT TELEPHONE AND TELECOMMUNICATIONS ALLIANCE

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The Independent Telephone and Telecommunications Alliance (ITTA) hereby submits these comments in response to the Commission's Further Notice of Proposed Rulemaking (Notice) released in the above-captioned dockets on November 15, 1999.[1] In the Notice, the Commission seeks comment on issues surrounding the remand by the United States Court of Appeals for the District of Columbia Circuit (Court) of the Commission's *Fourth Report and Order* establishing an effective X-factor of 6.5 percent, used by price cap incumbent local exchange carriers (LECs) to adjust their interstate access charges from year to year.[2]

I. INTRODUCTION

ITTA is an organization of midsize incumbent LECs each serving less than two percent of the nation's access lines. ITTA members collectively serve over six million access lines in 40 states and offer a diversified range of services to their customers. ITTA's smallest member company serves just under 100,000 access lines, while its largest serves just over two million. While most ITTA members are regulated under rate-of-return regulation in their provision of interstate services, some, such as Citizens Utilities Company and Cincinnati Bell

[1] *Price Cap Performance Review for Local Exchange Carriers*, CC Docket No. 94-1, and *Access Charge Reform*, CC Docket No. 96-262, Further Notice of Proposed Rulemaking, FCC 99-345 (rel. Nov. 15, 1999).

[2] *Price Cap Performance Review for Local Exchange Carriers*, Fourth Report and Order in CC Docket No. 94-1 and Second Report and Order in CC Docket No, 96-262, 12 FCC Rcd 16642 (1997) (*Fourth Report and Order*), *rev'd and remanded sub nom. United States Tel. Ass'n v. FCC*, 188 F.3d 521 (D.C. Cir. 1999). The Commission adopted productivity measurement of 6.0 percent and a 0.5 percent consumer productivity dividend. As used in this pleading, the term "X-factor" refers to this composite 6.5 percent annual adjustment factor.

Telephone Company, have elected price cap regulation under the Commission's rules. As competition develops, and in light of the Commission's ongoing reform of its price cap rate structure, additional ITTA members are considering the benefits of price cap regulation.

Under the Commission's rules, the Bell Operating Companies (BOCs) and GTE are required to participate in the Commission's system of price cap incentive regulation. Under price caps, incumbent LECs adjust their interstate access rates annually, not based on any direct measurement of carrier costs of providing interstate access services, but based on price cap formulae that adjust rates based on year-over-year growth, economic factors including inflation, and a productivity factor, or X-factor, which attempts to capture for ratepayers the benefits of LEC productivity gains relative to the economy as a whole. In the *Fourth Report and Order*, the Commission made its most recent revision to the level and structure of the X-factor, changing from a series of three elective X-factors with different "sharing" incentives to a single, mandatory 6.5 percent X-factor.

In the Notice, the Commission seeks comment on "how the prescription of the X-factor would affect smaller price cap LECs, and whether there should be a separate X-factor calculated for smaller price cap LECs."[3] Especially in light of the Court's holding that the Commission failed to articulate a rational explanation for its selection of the X-factor, even for large carriers, ITTA supports the establishment of a separate and lower X-factor applicable to midsize, elective price cap LECs.[4] Multiple productivity studies have shown that these carriers cannot achieve the same productivity gains as larger carriers.[5]

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[3] Notice at para. 48.

[4] The Telecommunications Act of 1996 specifically recognized the unique position of midsize ILECs, defined as those that serve less than 2 percent of the nation's access lines installed in the aggregate nationwide. The Commission subsequently created in its rules a category of "mid-sized" incumbent LECs that have annual operating revenues of less than $7 billion at the holding company level. *See* 47 C.F.R. § 32.9000 (Glossary).

[5] Jeffrey H. Rohlfs, *Differences in Productivity Gains Among Telephone Companies*, National Economic Research Associates, Inc. (Sept. 3, 1991) (*Rohlfs*) (attached as Exhibit A); Jeffrey H. Rohlfs and Kirsten M. Pehrsson, *One*

II. ECONOMIC DATA COMFIRM THAT MIDSIZE CARRIERS CANNOT ACHIEVE THE SAME PRODUCTIVITY GAINS AS LARGE PRICE CAP CARRIERS.

In remanding the Commission's *Fourth Report and Order*, the Court called the Commission's process for selecting the X-Factor "mystifying,"[6] and held that the Commission had "failed to state a coherent theory supporting its choice."[7] ITTA urges the Commission on remand to recognize the already-substantial record support for the fact that midsize carriers that have elected price caps cannot achieve the same level of productivity gains that are possible for larger carriers. In the *Fourth Report and Order*, the Commission explicitly disregarded these non-BOC productivity data.[8] Nevertheless, even for the BOCs, the Court held that the Commission had not adequately supported its conclusions. While the Court did not reach the midsize carrier issues raised by ITTA, there seems little doubt that the Commission's application of a single X-factor to these carriers without analysis of whether such an X-factor reflects these carriers' potential to achieve productivity gains cannot be sustained.[9]

Instead, the Commission must undertake a separate productivity analysis for these carriers. Since 1991, at least three economic studies have demonstrated that midsize carriers' year-over-year productivity gains trail those of the BOCs and GTE by between 1.0 and 3.1 percentage points.[10] The studies show that elective price cap LECs, such as Cincinnati Bell, that already enjoy relatively uniform low unit costs of providing service, and those, such as Citizens, that are part of relatively small holding companies, cannot achieve the same productivity growth

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Size Does Not Fit All: The Inadequacy of a Single X-Factor for All Price Cap Companies, Strategic Policy Research (1997) (*Rohlfs/Pehrsson I*) (attached as Exhibit B); *see also* Jeffrey H. Rohlfs and Kirsten M. Pehrsson, *Further Evidence Against the Adequacy of a Single X-Factor*, Strategic Policy Research (April 23, 1998) (*Rohlfs/Pehrsson II*) (Attached as Exhibit C).

[6] *United States Tel. Ass'n v. FCC*, 188 F.3d 521, 525 (D.C. Cir. 1999).

[7] *Id.* at 526.

[8] *Fourth Report and Order*, 12 FCC Rcd. at 16694.

[9] Indeed, the FCC received a Congressional Letter in support of this view in 1998. Letter to William E. Kennard, dated August 6, 1998 from Mssrs. Boehner, Strickland, Boucher, Sawyer, Chalbot, Oxley, Portman, Gillmor, and Brown, attached as Exhibit D *(Congressional Letter)*.

as the larger mandatory price cap LECs. These large carriers, in sharp contrast to the elective price cap LECs, serve much larger areas with more diverse cost characteristics and, accordingly, can take substantially greater advantage of economies of scale and scope.

While the mandatory price cap LECs generally serve tens of millions of access lines across multiple states with widely varying cost characteristics, elective price cap companies such as Citizens Utilities Company and Cincinnati Bell serve just over one million lines. Some, such as Cincinnati Bell and Global Crossing, serve relatively homogeneous, low-cost areas. Others, such as Citizens, while remaining small, have developed operating territories that stretch across dispersed and largely rural areas of the nation. In either case, the characteristics of these companies preclude the types of large productivity gains that the economic data may show for the BOCs and GTE.

As early as 1991, shortly after the Commission's initial adoption of a price cap system of rate regulation, a National Economic Research Associates, Inc. (NERA) study supported the finding that carriers with either small holding companies or low unit costs of providing service cannot experience the same level of productivity growth as larger, more heterogeneous carriers. The NERA study concluded that, "differences in productivity gains among telephone companies have a statistically significant relationship to the carrier's size and cost level. Smaller, lower cost carriers have lower levels of expected productivity gains than larger, higher-cost carriers."[11]

Updating this analysis with data collected after price cap regulation took effect, a 1997 Strategic Policy Research (SPR) study reached the same conclusion, focusing on data

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[10] *See Rohlfs, Ex. A; Rohlfs/Pehrsson I, Ex. B; Rohlfs/Pehrsson II, Ex. C.*
[11] *Rohlfs* at 3.

collected for Cincinnati Bell.[12] SPR, in its 1997 study and again using updated data in 1998, concluded that relatively small price cap LEC holding companies and those serving areas with relatively uniform low unit costs of service could not achieve the same level of productivity gains possible for larger, more diverse price cap carriers.

In its *Fourth Report and Order*, the Commission improperly selected the unitary X-factor because it failed to analyze independently productivity data either for midsize carriers generally, or for non-mandatory price cap LECs specifically.[13] Rather, the Commission explicitly stated its reliance on productivity data only for the BOCs. The Commission expressly acknowledged that inclusion of data from GTE, Sprint, SNET, and Lincoln resulted in a measured difference in productivity gains of 0.1 percentage point annually (on a base proposed X-Factor of from 2.7 to 3.1 percent) from 1988 to 1994 using USTA's model.

The Commission, however, missed the significance of this finding. First, the Commission concluded that it could give USTA's productivity estimates no weight because of perceived problems with its methodology.[14] Second, the Commission failed to recognize that, for the inclusion of data from these smaller carriers to have any impact whatsoever, the difference in the underlying productivity factors, of necessity, must be substantial. Assuming that GTE's productivity is similar to that of the BOCs, and given that GTE and the BOCs together serve approximately 92 percent of the nation's access lines, a measured difference in productivity gains overall of 0.1 percentage point would have translated into an X-factor for the

[12] *Rohlfs/Pehrsson I*; *see also Rohlfs/Pehrsson II*.
[13] *Fourth Report and Order*, 12 FCC Rcd at 16694 (1997).
[14] *Id.* at 16695.

remaining price cap companies of 3.5 percent, using the Commission's 1997 X-factor for illustration.[15]

III. THE COMMISSION SHOULD ESTABLISH TWO NO-SHARING X-FACTORS – ONE FOR THE MANDATORY PRICE CAP LECS AND A SECOND, LOWER X-FACTOR FOR THE ELECTIVE PRICE CAP LECS.

The Commission's 1997 explanation of its selection of a unitary X-factor is insufficient to justify its departure from its longstanding reliance on a selection of X-factors to address differences among productivity characteristics of price cap LECs. The Commission acted based on its conclusion that the record contained "no convincing proposals that would allow [it] readily to identify any characteristics by which [it] could assign individual X-factors to different price cap carriers, so that there could be multiple 'no sharing' X-factors."[16] While ITTA supports the Commission's elimination of sharing, which undermines the very incentives price caps are intended to provide, ITTA submits that the Commission's adoption of two "no-sharing" X-factors, one for mandatory price cap LECs and a second, lower X-factor for elective price cap LECs, would serve the Commission's goals while recognizing the important differences in productivity gains achieved by each group.[17]

Until the release of the *Fourth Report and Order,* the Commission itself recognized and accommodated the inherent differences in productivity among LECs. Indeed, in the original price cap system in 1990, the Commission chose to make price cap regulation

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[15] The following illustration disregards the 0.5 percent CPD, and instead uses, for mathematical analysis purposes, only the 6.0 percent productivity measure chosen by the Commission in 1997. Using the information in the *Fourth Report and Order*, the 0.1 percent difference represents approximately 3.3 percent of USTA's proposed X-Factor of 3.1 percent. Taking 3.3 percent of the 6.0 percent 1997 productivity measure, the gap between BOC/GTE data and that for all LECs would grow to 0.2 percentage points (*i.e.*, 3.3 percent of 6.0 percent is roughly 0.2 percentage points). Accounting for the fact that the BOCs and GTE serve 92 percent of the nation's access lines, the remaining carriers necessarily could achieve year-over-year productivity gains of no more than 3.5 percent, or just over half that of the larger carriers, to produce an effect of this magnitude on the aggregate data. While this result is consistent with the economic studies cited above (*i.e.*, a difference in productivity of 2.5 percentage points), ITTA urges the Commission at least to perform a similar analysis no matter what X-factor it ultimately selects, even if it fails to undertake a wholly separate analysis of midsize carrier productivity data.

[16] *Fourth Report and Order*, 12 FCC Rcd at 16704.

elective for all LECs other than the BOCs and GTE specifically because "the evidence accumulated in this proceeding casts doubt on whether all carriers below the largest eight in size can reasonably attain the productivity goal required by the price cap index."[18] Subsequently, citing the important public policy goals served by price cap regulation, the Commission sought to encourage more carriers to elect price caps by offering "three X-factor options, structured so that each LEC is likely to choose the option that is closest to its own implicit X-factor."[19]

ITTA concurs in the Commission's conclusion that it would create substantial regulatory burdens on carriers and the Commission alike, and needlessly complicate the price cap rules, for the Commission to establish an individually-tailored X-factor for each price cap LEC. To an ever-increasing degree since the Commission adopted price caps, however, two primary groups of price cap LECs, each with distinct characteristics, have emerged. The gulf between the large, mandatory price cap carriers has grown, even as the number of price cap carriers has decreased. Through a familiar series of mergers, including those between SBC and Pacific Telesis, SBC and Southern New England Telephone, SBC and Ameritech, Bell Atlantic and NYNEX, and the currently pending merger between Bell Atlantic and GTE, the original eight mandatory price cap carriers have now become five, and are likely soon to become four. The Commission may reasonably conclude that these truly gargantuan carriers are sufficiently similar to each other, and can take sufficiently similar advantage of their economies of size and scope, and the diverse economic characteristics of their service areas, that a single unitary X-factor may properly be applied to them. As demonstrated by the NERA and SPR studies, however, these LECs bear little

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[17] *See Congressional Letter, supra.*

[18] *Policy and Rules Concerning Rates for Dominant Carriers*, Second Report and Order, 5 FCC Rcd 6786, 6799 (1990).

[19] *Price Cap Performance Review for Local Exchange Carriers*, First Report and Order, 10 FCC Rcd 8961, 9055 (1995) (subsequent history omitted).

(and decreasing) economic similarity to the midsize carriers that have elected price caps despite the Commission's adoption of an X-factor now tailored only to the largest price cap LECs.[20]

IV. THE COMMISSION'S ADOPTION OF A SEPARATE AND LOWER X-FACTOR FOR THE ELECTIVE PRICE CAP CARRIERS WILL ENCOURAGE MORE CARRIERS TO ELECT PRICE CAPS.

The Commission has long recognized the public policy benefits of price cap regulation in the local exchange market, and should adopt an X-factor that encourages midsize LECs that potentially could succeed under price cap regulation to adopt this form of regulation. Price caps replicate the efficiency incentives of competition, offer LECs the potential to earn increased return on their investments, drive consumer rates down over time, and decrease the Commission's need to examine specific LEC investments and expenses.[21] In addition, since 1997, the Commission has made important changes to its access charge rate structure for price cap carriers to reflect and accommodate the development of competition.[22]

Since 1997, however, the number of price cap LECs has not increased, in part because the X-factor is too high for any but the largest carriers to sustain over time. Although Cincinnati Bell elected price caps in 1997, it did so out of competitive necessity.[23] Meanwhile, Aliant made withdrawal from price caps an explicit condition of its merger with ALLTEL. Puerto Rico Telephone Company has petitioned for a waiver to remain under rate-of-return regulation following GTE's acquisition of a major stake in that company.

LEC customers will enjoy the benefits of price caps only if their carrier participates in this form of rate regulation. Rather than straining to justify a single X-factor that

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[20] *See also Congressional Letter, supra.*

[21] The *First Report and Order*, 10 FCC Rcd at 8989-9004, discusses some of the benefits of price cap regulation.

[22] *See Access Charge Reform*, First Report and Order, 12 FCC Rcd 15982 (1997) (reforming the access charge rate structure primarily for price cap carriers) (subsequent history omitted); *Access Charge Reform*, CC Docket No. 96-262, Fifth Report and Order and Further Notice of Proposed Rulemaking, FCC 99-206 (rel. Aug. 27, 1999) (adopting pricing flexibility for price cap carriers).

is unsustainable for all but the largest LECs, the Commission should recognize that a more achievable X-factor, applicable only to elective price cap carriers, will provide additional incentives for these carriers to elect price caps.

[23] *See Price Cap Performance Review for Local Exchange Carriers*, CC Docket No. 94-1, Petition for Reconsideration filed by Cincinnati Bell Telephone Company, at 2 (filed July 11, 1997).

V. CONCLUSION

For the foregoing reasons, ITTA urges the Commission to adopt a separate X-factor applicable only to elective price cap LECs and lower than that applicable to mandatory price cap LECs. This separate and lower X-factor would recognize the inherent differences between the productivity gains achievable by midsize, elective price cap carriers and the larger, mandatory price cap LECs and would encourage midsize carriers to consider electing price cap regulation for their interstate services.

Respectfully submitted:

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COMMENTS OF THE INDEPENDENT TELEPHONE AND TELECOMMUNICATIONS ALLIANCE

January 7, 2000

EXHIBIT A

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DIFFERENCES IN PRODUCTIVITY GAINS AMONG TELEPHONE COMPANIES

by

National Economic
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Prepared for
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September 3, 1991

* Authors acknowledge helpful comments from Warren Lavey.

DIFFERENCES IN PRODUCTIVITY GAINS AMONG TELEPHONE COMPANIES

Rate regulation of telephone companies seeks to promote charges to ratepayers which reflect the operations of a reasonably efficient carrier. A key issue in rate regulation is whether a particular carrier is achieving productivity gains in line with reasonable expectations.

This issue is complicated by the widespread belief that the differing operating conditions of carriers cause differences in the productivity gains that can be reasonably expected. Through quantitative economic analyses, the study described herein confirms that **expected productivity gains should be lower for smaller carriers and carriers with lower starting costs.** This finding is statistically significant.

There are various methods of rate regulation. NERA supports implementation of methods of rate regulation which depart from the traditional "cost-plus" approach. Alternative methods of rate regulation can provide earnings incentives to carriers which stimulate further productivity gains and innovative offerings. These methods can benefit consumers through lower rates and improved quality of services compared to the cost-plus approach. Yet, **these methods of rate regulation can achieve their maximum effectiveness only if they reflect the differences among carriers in the levels of productivity gains that can be reasonably expected.**

Price-cap plans adjust rates based on an economywide cost index (which reflects economywide productivity changes), an additional productivity adjustment (reflecting the reasonable expectation of additional gains by a particular carrier) and "exogenous" factors. Under these plans, smaller, lower-cost carriers should have a lower productivity adjustment than the level applied to the Bell Operating Companies (BOCs) and GTE. **This study estimates a reasonable productivity adjustment for Centel that is 1.5 percentage points below that of the BOCs and GTE.** Productivity adjustments for smaller, lower-cost carriers which fail to reflect these differences will cause these carriers to earn unreasonably low returns. Where the productivity adjustment is developed from analysis of the BOCs and GTE or an

industry average, smaller, lower-cost carriers may reasonably choose to be subject to the traditional method of rate regulation instead of a price-cap plan.

Another method of rate regulation ("shared earnings" or "banded rate of return" plans) establishes a zone of earnings that a carrier can retain without partial or full refunds to ratepayers. These plans should reflect the fact that productivity gains can be more easily achieved by larger, higher-cost carriers than by smaller, lower-cost carriers. A level of productivity gains yielding, for example, earnings 200 basis points above some prescribed level may represent above-average efforts by a larger, higher-cost carrier. But, the same level of productivity gains and earnings would correspond to truly extraordinary efforts by a smaller, lower-cost carrier. **In order to match rewards to accomplishments, the zone of potential retained earnings for smaller, lower-cost carriers should be higher (more potential for retained earnings) than the zone for larger, higher-cost carriers.**

Finally, this study also has important implications for cost-plus methods of rate regulation. Traditional rate-base/rate-of-return regulation incorporates the concern about reasonable productivity gains in determining whether particular investments and expenses are "imprudent" or not "used and useful," or whether overall cost levels are "excessive." In these determinations, regulators frequently use other carriers' performance as bench marks. This study finds that a shortfall in the productivity gains by a mid-sized, lower-cost carrier when compared against larger, higher-cost carriers can reasonably be expected in light of their differing operating conditions. If such a shortfall appears, it should not be taken as evidence that the smaller, lower-cost carrier is inefficient or poorly managed.

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DIFFERENCES IN PRODUCTIVITY GAINS AMONG TELEPHONE COMPANIES

I. INTRODUCTION

This study analyzes differences in productivity gains among local exchange telephone companies. The principal finding—expected productivity gains are lower for smaller carriers and carriers with lower starting costs—is important for rate regulation of telephone companies, under any of a variety of methodologies.

NERA supports implementation of a price-caps form of rate regulation for telephone companies with several different productivity adjustments reflecting the differences in expected productivity gains by the companies. In particular, the productivity adjustment applicable to smaller, lower-cost carriers should be substantially below the level applied to larger, higher-cost carriers.

As explained in the final section of this paper, the findings of this study are also important for forms of rate regulation involving "shared earnings" or "banded rate of return" plans as well as traditional rate-base/rate-of-return ("cost-plus") regulation. However, the following description will focus on price-caps plans because of the attractiveness of this form of rate regulation and the efforts by regulatory commissions to estimate expected productivity gains as a factor in such plans.

A. The Price Caps Order

The Federal Communications Commission (FCC or Commission), in its *Second Report and Order* on Price Cap Regulation for Local Exchange Carriers (LECs) (CC Docket No. 87-313; Adopted September 19, 1990, Released October 4, 1990), sought to benefit ratepayers by promoting economic efficiencies and innovative, high-quality service. Price-cap regulation sets a maximum limit on the price that a LEC may charge for service. Because the price limit is less than that expected under rate-of-return regulation, customers can benefit from lower rates. At the same time, companies are able to increase profits if they can cut costs and increase demand or offer new services, yielding more efficiency. The plan was implemented in January 1991. While the FCC decided that the plan would be mandatory for Regional Bell Operating Companies (RBOCs) and General Telephone Operating Companies (GTOCs), the plan is optional for all other LECs not participating in NECA pools.[1]

[1] LECs participating in NECA pools are not permitted to elect price-cap regulation.

These "other" LECs are allowed a once-a-year opportunity to elect price-cap regulation, but a positive decision to elect price caps is irrevocable.

The annual adjustment formula for the price-cap index incorporates adjustments for inflation, special common line formula adjustment, exogenous costs and a productivity offset. The productivity offset represents the amount by which the LECs are expected to outperform economy-wide productivity gains plus a 0.5 percent "consumer dividend." The productivity offset is set at 3.3 percent or 4.3 percent at the option of each company. Those companies electing 4.3 percent are permitted to retain higher rates of return before being required to share profits with ratepayers. The appropriateness of across-the-board application of the 3.3 percent (or 4.3 percent) to a heterogenous group of companies which may differ vastly in opportunities for productivity gains is the issue explored in this analysis.

B. Application to Small- and Mid-sized LECs

In its *Report and Order*, the Commission hesitated to conclude whether either overall or individual productivity factors were appropriate for small- and mid-sized LECs. The Commission stated that the independent LECs are too diverse in terms of geography, business organization, historical growth rate, customer and resource base (among others) to predict the entire class's productivity gains on the basis of documented evidence on productivity gains. As a result of this uncertainty, the Commission chose instead to develop a better record of whether and in what cases a lower productivity factor would be appropriate for small- and mid-sized LECs.

Many state public utilities commissions have adopted price caps or other "incentive regulation" plans. Most of these plans are applicable only to the largest carrier (typically the BOC) in a state. Like the FCC, state commissions have not faced the issue of estimating a separate productivity factor for small- and mid-sized LECs. The efforts by state commissions to improve on traditional cost-plus rate regulation are commendable and would benefit from this study's statistical analysis of differences in expected productivity gains among telephone companies.

In this regard, the historical differences in productivity gains between the larger LECs (the BOCs and GTE) and other LECs are of interest. These past productivity differences suggest that the BOC/GTE LECs and other LECs face significantly different circumstances which affect their respective abilities to increase productivity over the current level. Figure 1 depicts how the smaller, independent companies compare historically to the Bell and GTE companies. Figure 1 displays the mean difference in change in total factor

productivity by independent LECs from the mean change in total factor productivity by the Bell/GTE composite[2] over the post-divestiture period 1986 through 1988 (years for which consistent data were available).[3] As the figure shows, the productivity gains of Contel and SNET were very close to the BOC/GTE average. However, productivity gains of the other four LECs (including Centel) for which data are available were much less than the BOC/GTE average.[4] Although (as Spavins and Lande have observed[5]) there is substantial year-to-year variation in productivity gains,[6] these historical results suggest that the Commission's concerns about applying a uniform standard of productivity to LECs of all sizes and affiliations are well-founded.

The historic productivity gains shown in Figure 1 clearly depict why a company like Centel would view as unreasonable a price-cap plan with a productivity adjustment based on the BOC/GTE average. For purposes of making reasonable predictions of future productivity gains, economists develop statistical models from such historic data. The remainder of this paper presents the results of our quantitative study which develops such a predictive model.

The study demonstrates that differences in productivity gains among telephone companies have a statistically significant relationship to the carriers' size and cost level. Smaller, lower-cost carriers have lower levels of expected productivity gains than larger, higher-cost carriers. This finding can be explained by differences in the carriers' operating conditions, including economies of scale and scope, and the rate of implementing advanced network technologies. Put differently, the management of a mid-sized carrier which through past efforts has been able to achieve relatively low costs of providing services cannot reasonably be expected to obtain the same productivity gains as a larger, higher-cost carrier.

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[2] The contributions of the member companies of each of the holding/operating companies were weighted by their respective revenues.

[3] Our methodology for estimating productivity gains is described in Section III.

[4] These results apply to *annual* productivity gains. However, as discussed below, the *absolute* cost level of several independents (including Centel) was lower than the BOC/GTE average. The lower level of absolute costs reflects productivity gains already achieved in previous years.

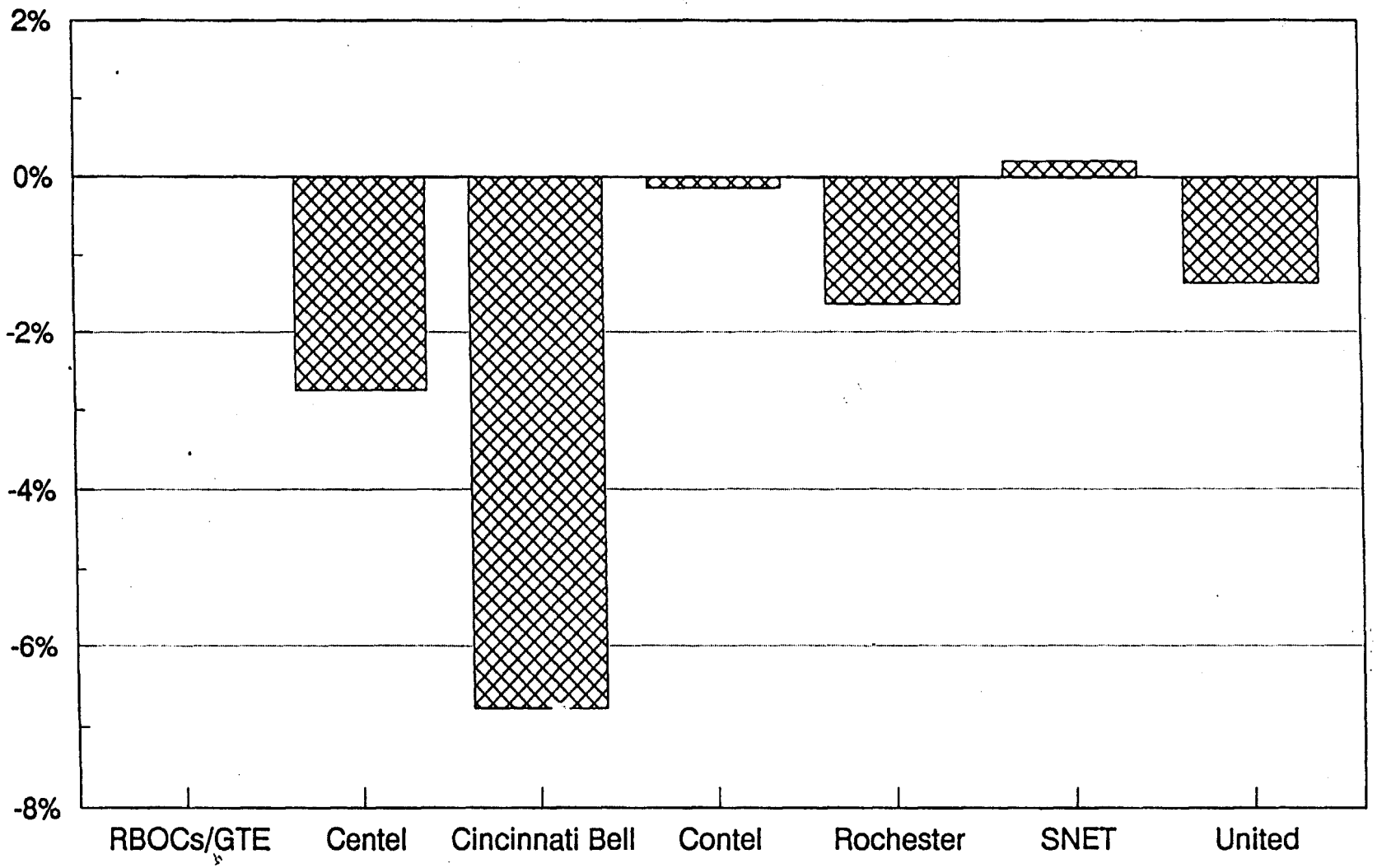
[5] Appendix D of *Supplemental Notice of Proposed Rulemaking* (CC Docket No. 87-313; Adopted March 8, 1990, Released March 12, 1990).

[6] In particular, the exceptionally low productivity gains of Cincinnati Bell during this period may be anomalous. In this regard, see our forecasted productivity gains for Cincinnati Bell (and other LECs) in Section IV.

FIGURE 1

Average Annual Change in Total Factor Productivity Relative to RBOCs/GTE (1986-1988)

(Percent)



Note: Data for Lincoln Telephone unavailable.

C. Purpose of This Study

The following analysis has been directed to the end of assisting the Commission in building its record on productivity gains. By examining the productivity differences among companies, we are able to gain insight into whether or not the inherent assumption of similar productivities embodied in the price-cap regulation is reasonable. Analysis of historical detailed statistical data for local exchange companies was undertaken to develop a better understanding of the true drivers of productivity changes.

Previous studies related to the price-cap proceeding have also examined productivity differences *in aggregate* between local and interexchange carriers, and between groups of local exchange companies. In particular, Christensen found that during the pre-divestiture period, productivity of independent telephone companies did not rise as rapidly as that of Bell companies.[7] This result is corroborated by Crandall and Galst for the period 1971 through 1983.[8] However, Crandall and Galst estimate that productivity gains of independent telephone companies exceeded those of BOCs from 1981 to 1988. This last result contrasts sharply with the findings of the present study. A possible reason for the discrepancy is that Crandall and Galst implicitly assume that Bell and independent telephone companies have equal output prices.[9] In reality, the prices of individual independents differ substantially from Bell prices, and there is no reason to think average Bell and independent prices are even approximately equal. Consequently, the Crandall/Galst estimates may involve substantial bias.

A further analysis of productivity differences was conducted by NERA. NERA demonstrated that Cincinnati Bell's productivity gains increased more slowly than that of the BOCs in both pre-divestiture and post-divestiture time periods.[10] However, none of these previous studies examined the specific causes of differences in productivity gains among individual companies. Therefore, the present analysis offers fresh insight into the issue of productivity differences among companies.

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[7] See testimony of Laurits R. Christensen in *United States v. AT&T*, Civil Action No. 74-1698 (D.D.C.), Defendant's Exhibit D-T-128.

[8] See Robert W. Crandall and Jonathan Galst, "Productivity Growth in the U.S. Telecommunications Sector: The Impact of the AT&T Divestiture," November 1990.

[9] Our methodology, based on physical output measures, makes no such assumption.

[10] *Incentive Regulation and Estimates of Productivity*, a study prepared for Cincinnati Bell Telephone Company, NERA, June 9, 1989.

II. MODEL

A. Approach

By using regression analysis of the dependent variable—productivity gains—on various intuitive determinants of productivity gains, we are able to test hypothesized relationships using empirical information. The model is developed by testing several productivity factors to arrive at a robust explanatory relationship. Once the prime determinants of productivity gains are specified, we are then able to analyze whether those factors can be expected to vary considerably across members of the LEC class for which price-cap parameters will be the same. In effect, we seek to identify the variables and coefficients for the equation:

$$\Delta TFP = a + b_1x_1 + b_2x_2 + b_3x_3 \ldots\ldots$$

where;

ΔTFP = Gain in Total Factor Productivity, and

a = intercept

$x_1, x_2, x_3, \ldots\ldots$ are determinants of productivity

B. Dependent Variable (ΔTFP)

The dependent variable which we explain with the model is the annual productivity gain or loss experienced by the individual companies. Productivity gain is defined precisely in Section III.B. It is essentially the excess (or shortfall) of the percentage change in outputs over the percentage change in inputs (after adjustments for price changes).

C. Candidate Independent Variables

Because the particular determinants of the productivity gains are unknown at the outset of the modeling process, several different intuitive explanatory factors were tested in developing the model. Most of these variables have been the focus of previous discussions of productivity factors. Each of the tested factors, and the justification for their consideration, are discussed in turn below.

1. Holding Company Size

As the size of the holding company increases, it may be expected to yield economies of scale, which would translate into increased productivity. Because growth in productivity would not be expected to increase linearly with size (for large differences in size), the natural logarithm of the holding company size was included as the regressor. This variable is illustrated for various companies in Figure 2. We measure holding-company size in terms of access lines. Data on other measures of carriers' size, such as access lines per study area or exchange, were not available on all the companies in the sample.

2. Cost Level

Inclusion of a cost variable is based on the simple premise that, if a company starts out with a lower cost level, its opportunity for (further) cost reductions (productivity improvements) is reduced. Therefore, high-cost companies may exhibit greater productivity gains than lower-cost companies. Factors affecting the cost level of a firm include the number of digital switches and the age of the plant. Digital switches, while initially requiring capital expenditures, lead to realized savings after installation. Similarly, newer plant affords costs savings through operating efficiency and improved technology, although originally incurring capital expenditures. The cost index used is defined precisely in Section III.B.

Figure 3 shows average costs of various independents relative to the BOC/GTE average. Comparing this figure with Figure 1, we observe that the three companies with lowest cost (Centel, Rochester and Cincinnati Bell) are precisely the three companies with the lowest annual productivity gains.[11] This suggests that the rationale for including costs in the ΔTFP equation is sound; and, indeed, costs do turn out to be statistically significant.

[11] As discussed further below, Centel has the lowest unit cost of any holding company in our sample. Lincoln Telephone has low costs, but because data are lacking, we were unable to estimate Lincoln's productivity gains. We note, however, that Lincoln elected not to go under price caps. This suggests that Lincoln does not expect especially large productivity gains in the future.

FIGURE 2

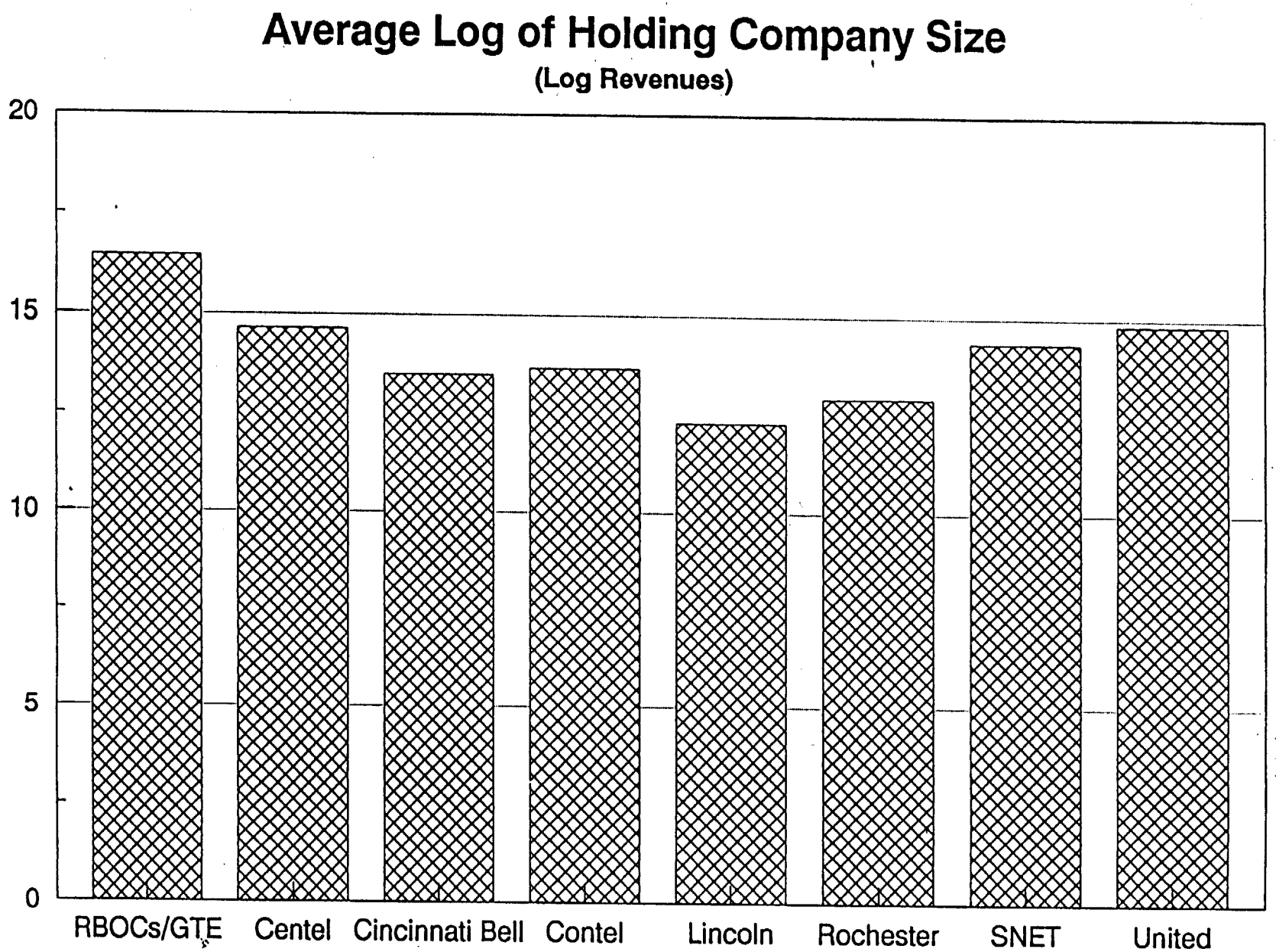
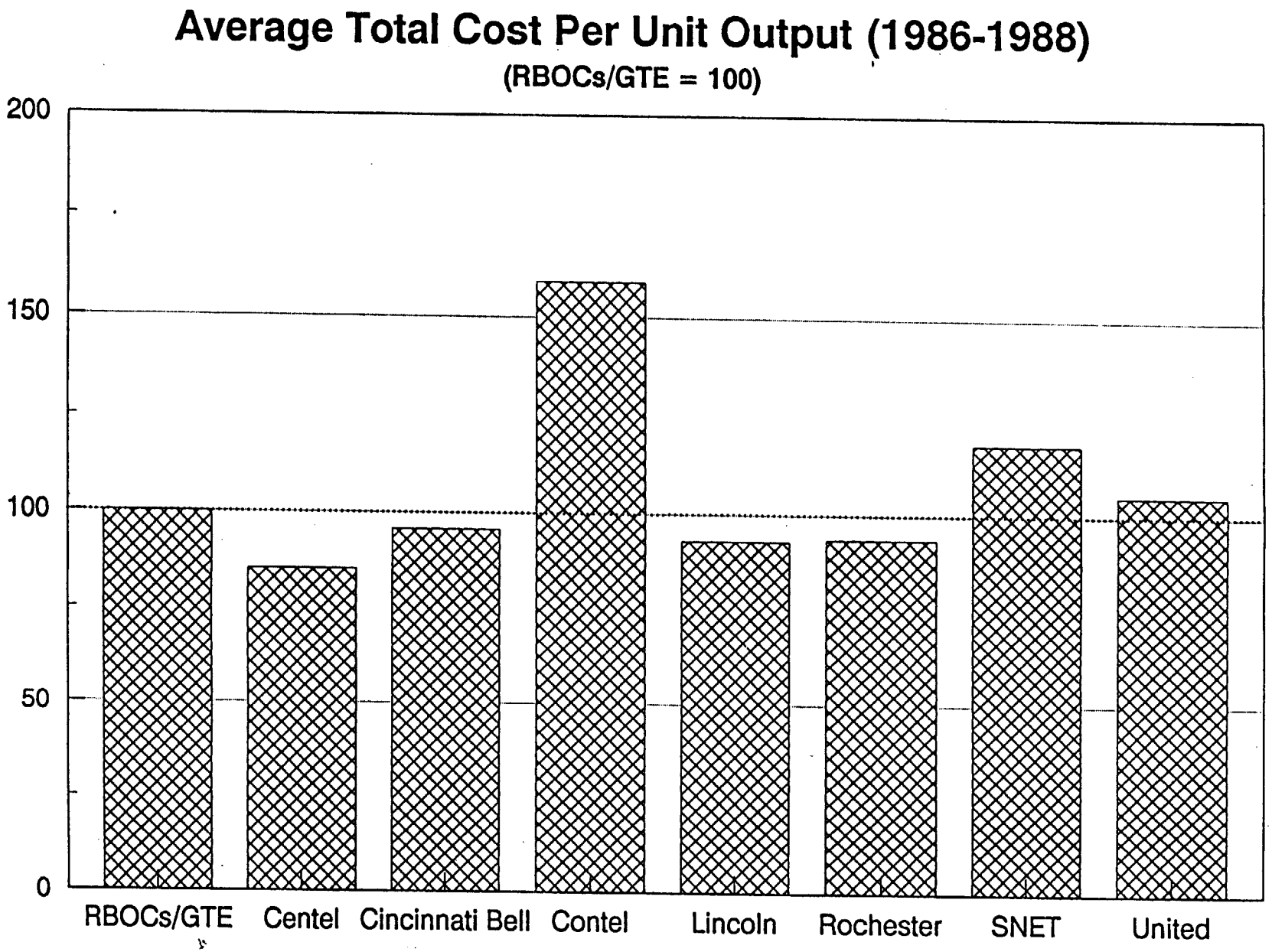

Average Log of Holding Company Size
(Log Revenues)
20
15
10
5
0
RBOCs/GTE
Centel
Cincinnati Bell
Contel
Lincoln
Rochester
SNET
United

FIGURE 3


Average Total Cost Per Unit Output (1986-1988)
(RBOCs/GTE = 100)
200
150
100
50
0
RBOCs/GTE
Centel
Cincinnati Bell
Contel
Lincoln
Rochester
SNET
United