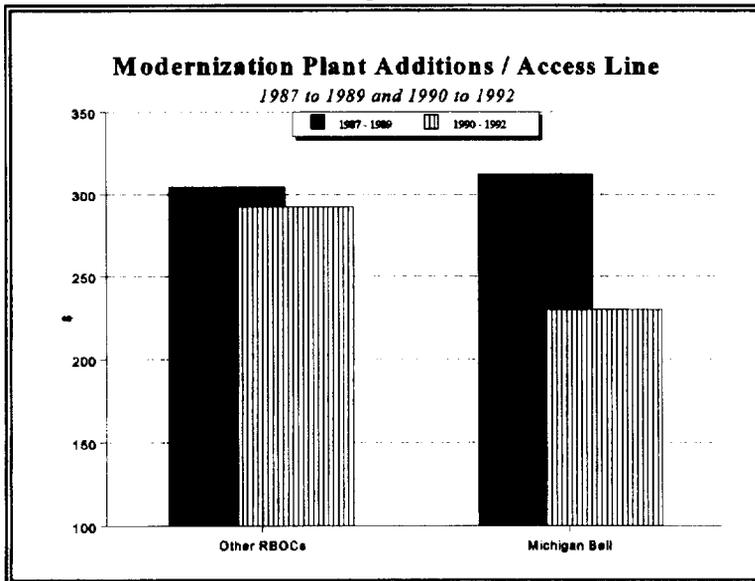


Though Bell characterized the spending plan as the result of the state's new telecommunications law, which gives it more freedom to add and price services, the amount is virtually the same as what the company has been spending on its system in recent years.³⁷

But, in fact, as Figure 3 shows, growth-adjusted investment by Michigan Bell between 1990 and 1992 has actually *declined* relative to the prior three-year period, and is well *below* than the average modernization investment by RBOCs outside our study group.

Figure 3



A more recent review by the state regulator essentially confirms that the trend of the last few years is continuing, as Figure 3 shows. Their report notes:

Michigan Bell announced a \$2.0 billion construction program for the period 1992 to 1995. The program is intended to deploy "high tech" information age facilities throughout Michigan. This commitment is significantly lower than the construction expenditures in the previous 4 years prior to Act 179.....

The Michigan Commission drew the only possible conclusion from these trends:

Significant revenue increases in...previously closely regulated services have served to bolster the company's income. Increased internal cash flows generated by higher depreciation rates coupled with the scaled back construction program provide discretionary funds that can flow to Michigan Bell's parent Ameritech or can be used to support competitive activities.³⁸

³⁷ *Detroit Free Press*, March 4, 1992, page B-1.

³⁸ Michigan Public Service Commission, "1994 Report to the Governor and the Legislature as Required by 1991 Public Act 179." December 1993, pages 29 and 31. In a modification from an October 1993 draft, the report noted that Michigan Bell had modernized some network facilities in the Upper Peninsula of the state, but noted that the central office upgrades were slated before, and not affected by, passage of the alternative regulation law.

Kansas, Missouri and Texas each adopted regulatory reform plans that included specific features regarding infrastructure investment. Southwestern Bell sponsored similar plans called "TeleFuture 2000" in Missouri, "Texas First" and "TeleFuture Kansas" that called for the diversion of most excess earnings towards network modernization. The plans in Missouri and Texas were modified after regulatory review and adjustments to the Southwestern Bell's rates, but the regulatory plans still incorporated expectations based upon Bell's infrastructure spending commitments. In Texas, for example, the PUC found:³⁹

The stipulation will result in network upgrades over a four-year period, such as central office upgrades, the upgrade to one-party service, and the expansion of EMS service, which might not be possible in the context of a traditional rate proceeding....[T]he Commission...does not have the authority to manage the Company's business and assets. It is not clear that the Commission would have the authority to direct the Company to implement all of the network upgrade provisions...particularly without additional costs to customers.

Again, however, subsequent reviews of the effects of these plans have shown that such expectations were not matched by reality. Reviewing the 1990 alternative regulation plan adopted in Missouri, the PSC staff noted last year:

[Southwestern Bell] claims that Missouri benefitted in network modernization [from the alternative regulation plan]. However, as we demonstrated through the Staff's analysis, these statements are misleading. SWBT-MO operations did not receive any greater percentage of construction funding...Increased construction funding in the 1990-1992 time frame was the result of greater total Company funding and not the result of the [Missouri regulation plan]....From the staff's perspective, SWBT is demanding incentive regulation in this proceeding as the price to maintain a status quo construction program, and the Staff has seen no evidence to support the Company's claim that they will go beyond the ordinary construction funding in relative terms for Missouri if the [new incentive] proposal is adopted.⁴⁰

Southwestern Bell continues to link new infrastructure spending with claims for regulatory relief in Kansas. In an Op Ed piece dealing with the Kansas Legislature's consideration of telephone regulatory legislation, the Bell Kansas President claimed that, "In order to make the size of additional investments proposed in S.B. 591 — \$138 million above our normal construction spending in the next five years — our investors require a reasonable assurance

³⁹ Inquiry into the Reasonableness of the Rates and Services of Southwestern Bell Telephone Company, Public Utility Commission of Texas, *Order*, Docket No. 8585, November 21, 1990, p. 17.

⁴⁰ Testimony of Missouri PSC staff member Greg Meyer, Public Service Commission Case No. TC-93-224, p. 7.

that they eventually will be able to earn on their investment."⁴¹ State officials have no way to determine what Bell's "normal construction spending" would be, because they don't participate in the capital funding decisions. This claim, like all of the linkages between network investment and increased cash flow, is entirely *unverifiable*, as the staff in Missouri found. Thus a major Kansas newspaper editorial identified the cost of this infrastructure linkage:

[W]hy were the state's elected officials wrong to do Bell's bidding? Because it will cost Kansas business owners and homeowners connected to the Bell system millions of dollars more than they might have had to spend for phone service between now and March 1, 1997, when the state's agreement with Bell expires.⁴²

Thus, every report we obtained that examined whether a particular alternative regulation scheme resulted in more investment came to a negative conclusion. Additionally, several statistical analyses have been made using multi-state, multi-LEC data and have reached the same conclusion.

⁴¹ Susan B. Fox, "Kansas Bell Perplexed By Criticism," *Kansas City Star*, February 21, 1994.

⁴² "Bell's Touch" *The Wichita Eagle*, April 16, 1994.

Multi-State Studies Of Infrastructure Linkages

The conclusion that various forms of regulation have had *no effect on the levels of actual investment*, has major implications for designing incentive regulation schemes. As such, these findings warrant additional study. Recently new studies have empirically examined factors that influence LEC investments in the regulated networks, as well as whether the form of telecommunications regulation has a significant effect on the *quantity* or *types* of infrastructure investment across different states or telephone companies. These studies all show that there is no linkage.⁴³

One widely-circulated study last year concluded that whatever cash flow regulators authorize for the telephone operations of the Bell companies is claimed by the parent holding companies, and used to invest in unregulated and/or foreign ventures:

[T]he cash flow allowed by regulators has not been used to acquire new BOC plant, but has instead been handed over to the parent for its use in investing in non-BOC businesses...virtually all of each RBOC's retained earnings come from earnings *at the BOC level* yet virtually none of those retained earnings are being reinvested *in the BOCs*. The other RBHC non-BOC businesses...are operating either at a net loss or are generating no more than a minuscule positive return.⁴⁴

The study disclosed the same broad trends among all of the Bell telephone and parent companies; it did not look at whether different regulatory plans and policies had any effect on the broad trends among specific state jurisdictions. However, an increasing number of multi-state empirical reviews of investment and technology deployment, including a new analysis we performed, show a *broken link* between incentive telephone regulation plans and any stimuli to network infrastructure investment.

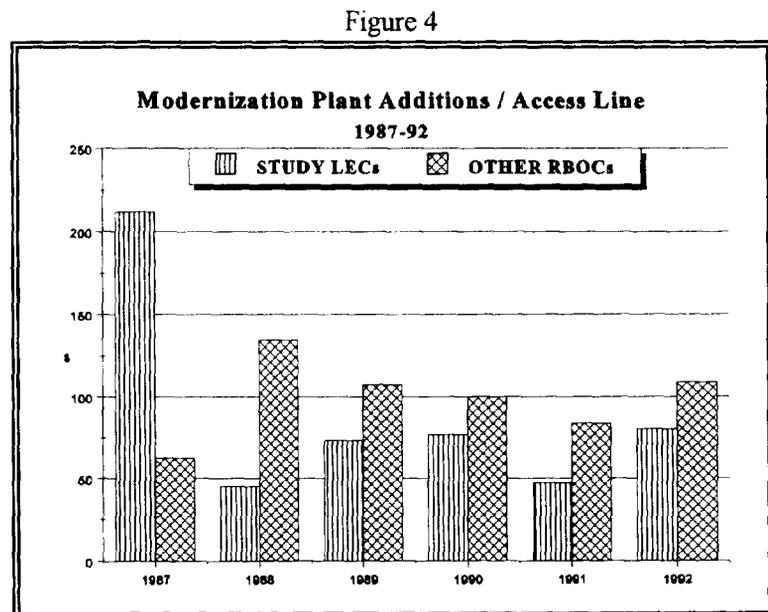
The Plant Additions Study. We examined independently whether regulatory "reform" plans in several specific states had any effect upon the modernization-related investment levels. Our study compared levels of gross plant investment and access line growth for LECs in particular states between 1986 and 1992 to the total gross plant additions for

⁴³ Another work in progress by the National Regulatory Research Institute, "The Impact of Alternative Regulatory Pricing Regimes," is also tentatively slated to examine investment trends.

⁴⁴ Economics and Technology, Inc., (ETI) "Patterns of Investment by the Regional Bell Holding Companies," May, 1993, page 2.

Regional Bell Companies outside the study group.⁴⁵ We adjusted the gross plant additions per access line in order to determine the portion of the LEC's expenditure that could be attributed to access line growth, versus the network modernization that allegedly motivated the alternative regulation plans. We estimated that a LEC would incur a cost of \$1300 for each access line it added. This value is consistent with several independent estimates of the average costs of adding a new line.⁴⁶ The LEC's total investment, net of the cost assigned to access line growth, is considered to be investment in modernizing the network. The proportions of gross plant additions devoted to network modernization were computed for the seven test states separately and for all seven combined, and then tested for the same data for all Bell companies and jurisdictions that were not part of the study set.

We examined data from 1986 to 1992 where available; we had complete data for the 1990-92 time period. Because the interstate price cap plan for LECs was initiated in 1990 and most of the state plans had been defined by then, 1990-92 represents the period with the most consistent set of incentive regulations plans in place. As shown in Figure 4, there are few discernable differences in the year-by-year investment patterns among the two groups of LECs. But the LECs in the study actually reduced their modernization-related expenditures in the early part of the period, and, overall, maintained lower investment spending on network modernization. Among the seven states we examined, only Oregon realized markedly higher plant investment levels after 1989, as shown in Figure 5. Four states had significantly *lower* modernization expenditures during the period

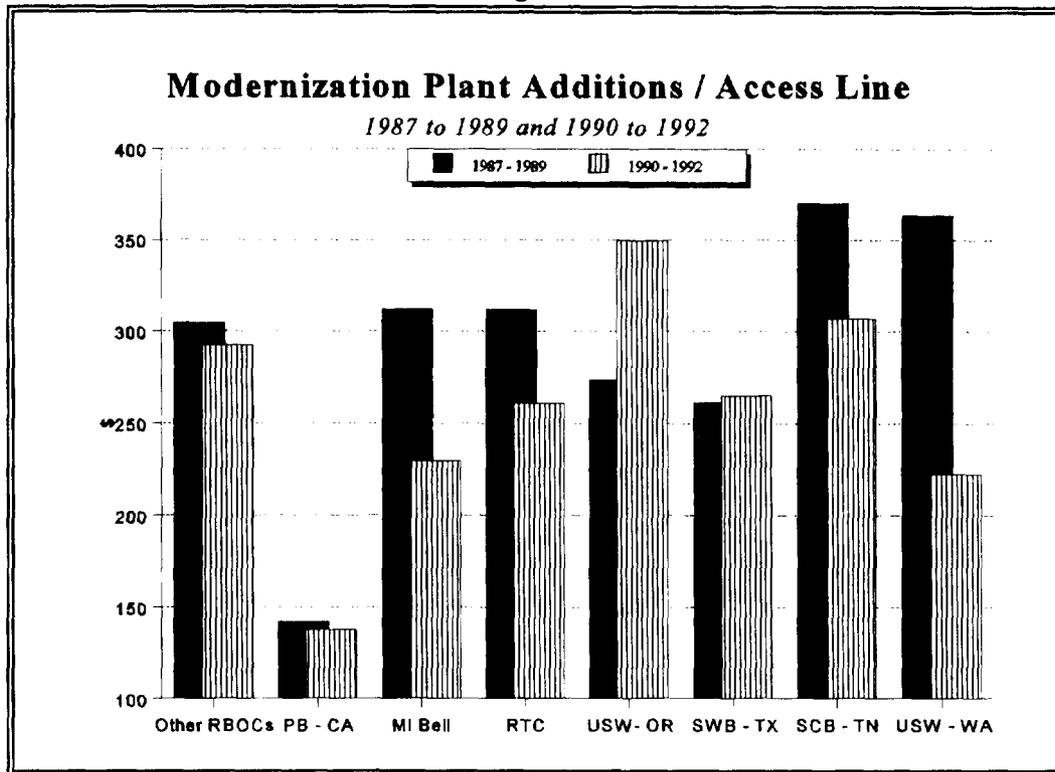


⁴⁵ Examining investment in terms of gross plant additions eliminates the effects of depreciation practices that appear when only changes in net plant investment or rate base are used as the measure of new investment activity.

⁴⁶ Our data and techniques are discussed in more detail in the Study Appendix.

of so-called "incentive" regulation, and two showed virtually no change.⁴⁷

Figure 5



Other empirical analyses of investment and technology trends. Other statistical analyses of LEC investment trends also support our findings, as well as the results of the *ex post* reviews of state infrastructure plans. A paper written by Timothy Tardiff and William Taylor, two analysts whose work is often used by local telephone companies, analyzed data

⁴⁷ Oregon experienced a statistically significant change in investment per added access line, but telephone service demand also grew at rates well above the national average. While our data was adjusted to account for access line growth using an average value of \$1300 per added access line, some of the construction likely was required to accommodate the growing network usage as well as the access line growth. Therefore, part of the differential investment in Oregon may not be captured by our growth adjustment. Similarly, Rochester Telephone reported a large increase in gross plant additions per access line in 1991. However, in March of that year it incurred major costs associated with outside plant replacement following a severe ice storm. See Rochester Telephone Company, FCC Tariff Transmittal No. 149, August 23, 1991.

categorized at the state level among six types of alternative regulation plans.⁴⁸ The study identified the primary types of incentive regulation plans by different indicators: Deregulation, Pricing Flexibility, Price Indexing, Earnings Sharing through a Banded rate of return (Banded ROR), and Price Freezes. A composite, summary indicator specified whether a state had adopted any one of these "incentive" forms of regulation or not.

The study found that some incentive regulations have positive effects on telephone companies' profitability. This result is hardly surprising given that the underlying LEC motivations for seeking reforms is to boost their financial performance without facing the scrutiny of their overall costs and earnings. But the study nevertheless concluded that different regulatory plans had *no effect on investment levels or technology "diffusion."*⁴⁹ The authors started with the somewhat contradictory premises that "the lack of incentive under *cost-plus regulation*... may lead to under investment in the public switched network" but "a priori it is not obvious that accelerated investment is necessarily beneficial."⁵⁰ These two premises illustrate precisely the paradox we identified in this report. It's important for the telephone companies' overall strategy to denigrate pre-existing regulatory plans at the outset but unwise to highlight the infrastructure linkage after the fact — because that linkage may not have been sustained in reality.

Empirical, multi-state analyses of telecommunications investment agree with individual state findings that the incentive regulation / infrastructure link does not exist.

Tardiff and Taylor then statistically confirm that the linkage is missing. Analyzing changes in total net network investment (plus depreciation expense for each year), they reported, "Our analysis of

investment generally produced *no significant effect* for either the incentive regulation summary indicator or the individual regulatory reform indicators."⁵¹ Looking at types of technology deployed by LECs, they found that "new technology tends to be greatest with flexible pricing and banded ROR, but...the individual effects are generally *not different*

⁴⁸ "Telephone Company Performance Under Alternative Forms of Regulation in the U.S." National Economic Research Associates (NERA), (Cambridge, MA), September 1993.

⁴⁹ Technology "diffusion" means the rate at which specific telecommunications technologies like ISDN and Signalling System 7 were installed in each of the states or how fast digital switching was deployed to replace earlier generations of equipment.

⁵⁰ *Id.*, pages 21-22.

⁵¹ *Id.*, pages 32-33. Emphasis added.

from one another when statistical significance is accounted for.⁵²

In striking agreement with the NERA analysts, Mark Cooper, Research Director of the Consumer Federation of America, reached quite similar conclusions. Many consumer advocates questioned from the outset whether the LECs' infrastructure linkage was anything more than public relations. But now analysts for both LECs and consumers have found an unusual common ground. Cooper conducted his own statistical analysis of the relationship between the form of regulation and the rate at which modern technologies are introduced into LEC networks, and concluded that:

alternative regulation does not have a significant positive effect on technology deployment. Banded rates of return show a negative association with the deployment of fiber and SS7. Pricing flexibility and price freezes showed a positive association with the deployment of digital switches [but not for any other technology studied]. Price indexing and deregulation exhibit no statistically significant associations whatsoever.

Cooper also noted that *higher net income for the Bell companies is actually negatively correlated with the deployment* of digital switches and ISDN. Notwithstanding *higher profits* from monopoly services, LEC investment in the key technologies is lower under some forms of incentive regulation. Higher profits paid as dividends to the holding company are less likely to be returned to the state jurisdiction that generated them in the form of added investments, perhaps because the LEC hopes to continue to exploit the infrastructure linkage argument in the state in the future. Cooper observes that "the companies tend to take the money and run."⁵³

⁵² *Id.*, page 35. Emphasis added.

⁵³ Mark Cooper, "Milking the Monopoly: Excess Earnings and Diversification of the Baby Bells Since Divestiture," Consumer Federation of America, February, 1994. Appendix A, page 20. See also, Cooper, "Divestiture Plus Eight" Consumer Federation of America, December 1991.

Why The Infrastructure Investment Linkage Is Missing

The consensus among the studies discussed above, and our own analysis, indicates that to date incentive regulation schemes have not stimulated infrastructure investment. The question is, "Can regulation *ever* be designed to create this linkage?" The answer to this question is "No." Regulation remains necessary from the standpoint of consumer protection — i.e., to protect users of monopoly services from well-defined abuses. But regulation is only one of many economic factors that affect investment decisions for telephone companies.

Neither regulators nor others who want to promote the information superhighway sit on the boards of directors of the LECs. They cannot ensure that additional funds made available through any regulatory plan that stimulates the cash flow from regulated services will, in fact, be directed back towards the infrastructure. Notwithstanding a regulator's effort to raise the apparent return from regulated services in order to stimulate accelerated investment in the infrastructure, many factors that are beyond the regulator's control may result in a very different, lower calculation of the net present value of the same investment by the firm's managers or directors.

The net present value calculation must account for factors that are well beyond the control of any given set of regulators. The investment decision must consider if the recovery of the added costs could be sustained over the life the investment. An incentive to invest in accelerated infrastructure development can be sustained only if the cash flow produced by the regulatory plan were maintained for a period of time sufficient to ensure full recovery of the added costs. A telephone company's risk aversion would be compounded by the general uncertainty about demand and whether the elasticity of demand can be properly estimated in advance.

For example, if consumer demand for new infrastructure services developed slower than expected, the LEC would seek some assurance that regulatory cost accounting rules would change in its favor, so as to allow recovery of additional costs from "basic" services with less elastic demand. If the LEC could not *a priori* assume the regulators would allow favorable changes in cost allocation rules, it will remain adverse to re-investing the added cash flow generated by the regulatory plan in the telephone network.

Ironically, the only regulatory regime with incentives specific enough to lead to guaranteed

increased investment would have two features: It would have to allow an earnings level somewhat higher than the market cost of capital, in order to induce telephone companies to increase capital funding for regulated services compared to other

As long as regulation does not guarantee a return on new investment, a supply-side regulatory investment stimulus will not be effective.

investment opportunities. The regulation also would have to guarantee a revenue stream to pay for the added investments — including increases in the basic monopoly services, even if charging those services for revenue deficiencies involved an explicit cross subsidy. And, the regulator might actually have to mandate specific investment levels by the LEC — to substitute, in other words, its own rules for the workings of the marketplace and the decision making of the firm's management.

As results like those in Vermont show, merely mandating that money be spent on the infrastructure is not sufficient in itself because revenue stimulation may prove to be inadequate to pay for the investment and the LEC's earning will suffer. Revenue increases must be ensured in order for the LEC to achieve a premium return on its added investment. *This regulatory regime, in other words, would have to meet the specifications and induce the precise behavior of the Averch-Johnson effect, for a rate base / rate of return regulated public utility.⁵⁴ This is ironic: The basic rationale for incentive regulation is to terminate these types of inducements.*

An investment stimulus creating a *de facto* guarantee of supra-normal profits on certain capital additions would fly in the face of efficiency incentives. If it were to overcome the many factors *outside the control of regulators* that influence investment decisions, an infrastructure stimulus would have to be so strong that it could distort other goals, like controlling monopoly rates. LECs' investment decisions also would be removed even further from the normal competitive functioning of public capital markets. Today, all analyses show that most major LECs' cash flow significantly exceeds their capital expansion requirements for regulated services. Significant new, *external* financing of LEC ventures is rare. Thus, even today LEC plant investment is not subjected to the independent disciplines of the public capital market, and there is no market assessment of the relative business and financial risks of LEC entry into new, highly competitive markets.

⁵⁴ Harvey Averch and Leland Johnson, "Behavior of the Firm Under Regulatory Constraint," 52 *American Economic Review* 1052 (1962).

The strategic mix of the LECs' investment alternatives also will figure in the assessment. Strategic investments might be targeted towards video, long distance, personal communications or other services. They might be designed to increase interconnection costs, or strengthen their existing markets against effective competitive entry by challenging the *existing* businesses of potential local market entrants. A regulatory plan that attempted to create a "supply-side" stimulus to LEC infrastructure investments would presumably have to include checks on the LEC's incentive to target the spending strategically. On the other hand, public policies designed to avoid creating a class of high-tech information "have-nots" may confine the LEC's ability to strategically invest its added cash flow, but also cause new headaches for regulators.⁵⁵ And, notwithstanding its efforts to target investment strategically, the LEC still confronts the risk that it will mis-estimate the competitive responses of the incumbent firms in targeted markets.⁵⁶

There is nothing new or unusual in these considerations, all of which are inherent in calculating the true net present value of any investment alternative. The LECs' internal calculations of expected NPVs must largely explain their current investment patterns, such as investing in national telecommunications sectors outside the United States. Most countries' telecommunications or cable television industries are far less developed than in the U.S. There is untapped demand for services already widely used in the U.S. In many other nations, for example, LEC investments are used to supply basic voice services — which are well-understood by LEC engineers and other personnel — or cellular telephone services facing little if any competition. Regulation in this country cannot affect the conditions in other countries that make foreign investments attractive to U.S. companies.⁵⁷ Nor is it likely that expansion into restricted markets like long distance or manufacturing would stimulate investment in their core local telephone networks, as some Bell companies

⁵⁵ This issue is already arising with respect to LEC deployment of facilities and technology needed to compete with cable television systems. See *Petition for Relief from Unjust and Unreasonable Discrimination in the Deployment of Video Dialtone Facilities*, submitted by the Center for Media Education *et al.*, Federal Communications Commission, RM-8491, May 23, 1994.

⁵⁶ Moreover, of course, competitive responses are among the most complex factors in a decision-making model of this type. Many demand modelling techniques used in the telephone industry have eschewed attempting to incorporate the effects of competitors' possible changes in their own prices and services in response to changes in a dominant carrier's own offerings.

⁵⁷ In contrast to scalable telecommunications investment alternatives in other countries, investment induced by regulators in the part of the U. S. telecommunications infrastructure could be much larger in scale and more expensive, due to the high connectivity properties of telecommunications networks. Nobody ever built half of a fiber ring.

suggest. Eliminating such restrictions would provide the major LECs with *still more opportunities* to divert investment away from the local infrastructure.

The Results Of The Broken Linkage

The cash flow derived from regulated services, but not re-invested in those services, is gone for good.

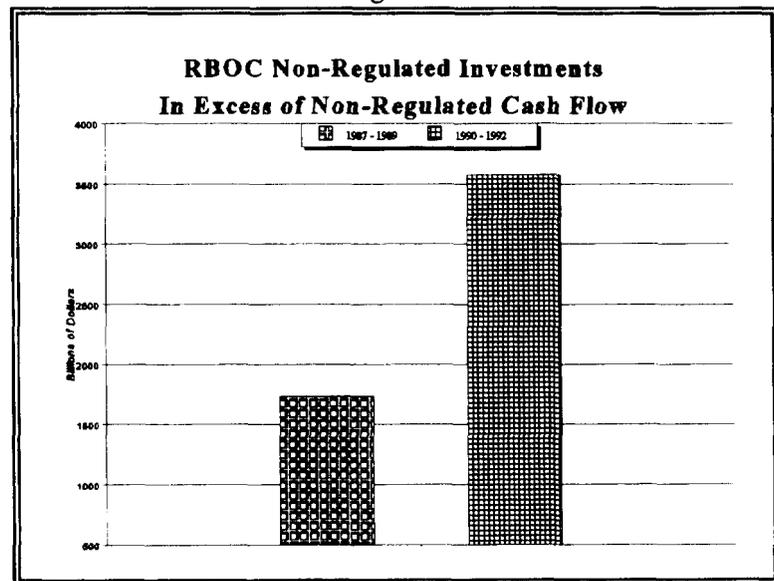
An explicit investment stimulus might be injected into a regulatory plan, but not without serious tradeoffs. Moreover, regulators should be aware of the transitory nature of the various regulatory infrastructure initiatives. Regulatory plans that boosted

LEC cash flow in the late 1980s and early 1990s can *never* have a positive *future* effect on LEC network spending levels if that cash flow already has been spent on other ventures. And, the awards granted by regulators in those years are not self-sustaining. In fact, because LEC plant is being depreciated faster than new plant is added, the nominal cash flow from regulated services will eventually decline.

The diversion of funds by LECs from regulated operations to new ventures has continued at a rapid pace during the early era of the plans allegedly designed to improve the regulated network infrastructure. Figure 6 illustrates the net *inflow* of investments by the Regional Bells into non-regulated operations. That is, Figure 6 shows the amount by which the RBOCs investments in new ventures exceeded the

cash flow generated internally from the earnings and depreciation available from those same ventures. In the 1987 to 1989 period, when regulators were first being importuned to adopt incentive regulation plans, the overall net investment outflow from Bell regulated operations to non-regulated operations amounted to some \$1.733-billion. During the more recent incentive regulation period, 1990 to 1992, the net outflow

Figure 6



more than doubled to \$3.579-billion.⁵⁸

Once this money has gone into non-regulated businesses it is gone for good. Ironically, the LECs' ability to continuously generate high cash flow from regulated operations is not self-sustaining. BOCs have been awarded significant increases in depreciation rates in recent years, particularly for plant accounts that include older technologies like electromechanical switches, metallic outside plant and older vintages of radio and circuit equipment. Indeed, several state infrastructure spending plans focused on accelerating the replacement of these technologies by devoting portions of LEC excess earnings to that purpose.

Overall, these faster depreciation schedules, coupled with the LECs' generally low levels of new investment, have resulted in declining plant per access line. By 1992, only NYNEX among the RBOCs had more telephone plant in service per access line than it had in 1989. Since 1989, all other Bell companies' gross plant investment has actually declined. The lower levels of total investment and the effects of several years of rapid depreciation in the selected, older technologies have combined so that the BOC annual depreciation expenses per access line are actually trending downward for all of the companies but NYNEX. NYNEX will soon join the other BOCs in the downward trend; in 1991 and 1992 NYNEX realized \$279 of depreciation expense per access line but invested only \$261.

Thus, LECs must continue to try to sustain the promised linkage between regulatory relief and infrastructure investment, regardless of the facts. Therefore, regulators may soon be faced by new claims from the telephone companies that their cash flow available for new investment is shrinking, and that new investment in the network will be jeopardized unless still higher earnings or depreciation expense accruals are authorized. Ironically, these claims will be derived directly from the combined effects of higher depreciation *rates* established in the 1987 to 1990 period — and the telephone companies' strategies of squeezing cash from regulated operations for investment in new ventures.

Such conditions serve to underscore a central point: Regulatory incentive plans should have both clearly-defined objectives from the outset and well-defined means for measuring

⁵⁸ These data are derived from the ETI study, footnote 44 above. Since 1986 the total outflow to non-regulated RBOC ventures, net of the cash flow generated by those operations, exceeds \$7,000,000,000. The rate of outflow to their non-regulated operations varied significantly among individual RBOCs. NYNEX, Pacific Telesis, and Southwestern Bell had the largest net outflows from regulated to non-regulated operations.

whether those objectives are achieved. In gathering the information for this study we were struck by how few of the alternative regulatory plans now in existence come with their own pre-defined benchmarks for evaluating success or failure. A number of states have developed various *ad hoc* studies of the effects of alternative regulation plans already in place, as noted above, but there appears to be no consistent pattern for defining *in advance* what objectives are meant to be achieved by the plan or, *ex ante*, how they will be measured.

The economic factors that regulators do not affect will continue to grow in their relative importance as telecommunications competition increases. In these circumstances, any supply-side effort to stimulate network investment through the form of regulation will be even less likely to succeed.

Conclusion

The U.S. telecommunications industry is rightly considered the most dynamic in the world. U.S. telephone users have access to more telecommunications vendors, more services and more efficient vertical applications than users in any other country. It's no wonder that most other nations are now striving to achieve the successes of the U.S. in telecommunications policy. Competition in many U.S. telecommunications sectors is the key to these conditions.

But regulation of local telephone companies still plays a vital role in shaping the future. Competition is emerging but it is far from being well-developed. Alternative vendors of local telephone access services operate less than 4% of the fiber optic facilities installed by local exchange carriers. Local telephone companies still bill *1.3-times more long distance toll revenues* than the *second largest* U.S. long distance carrier, MCI. Much is made today of possible competition between local telephone companies and providers of cable-TV services to homes and businesses, but *merely the retained earnings* alone of the local telephone industry (\$24.5 billion) are 15% greater than the *total annual revenues* of the U.S. cable-TV industry (about \$21.5 billion).⁵⁹

"Incentive" regulation plans at both the state and federal level have not, to date, pursued any objectives that are fundamentally inconsistent with the

Regulation of dominant telephone companies should adhere to its consumer protection role, not attempt to become an engine of economic development.

⁵⁹ 1992 data from FCC Statistics of Common Carriers and Paul Kagen Associates, respectively.

traditional goals for economic price regulation of firms possessing unusual market power. The motivation in most reform plans has been to better achieve these ends and to improve the economic efficiency of regulation in the bargain. In the future, however, emphasizing a supply-side rationale aimed at promoting private sector investment in advanced telecommunications networks, while possibly well motivated, could seriously undercut established policy goals designed to promote efficient, lower rates for basic telephone services and to protect consumers.

The evidence shows that telephone incentive plans with supposed infrastructure spending stimuli lead to unknown destinations. Without a clear sense of direction, will we ever know that we have arrived?

Telecommunications Infrastructure, LEC Investment and Regulatory Reform

Study Appendix

Several studies noted in this report agree that various forms of incentive regulation have no effect on the levels of actual investment. We developed other ways to examine relationships between LEC investment, the form of state and federal regulation and the disposition of the Bell companies' available cash flow in order to determine if these conclusions could be confirmed. One of the more complete studies discussed in the report¹ did not use state-specific data in those cases where the data for multi-state Regional Bell companies are aggregated in FCC reports. Instead, the report weighted the total RBOC data by the access lines in the state(s) with the particular forms of alternative regulation (e.g., earnings sharing, price caps, price freezes, etc.) that were being examined.² This approach may or may not introduce a bias into the analysis; the approach does simplify data collection requirements.

One of the criteria by which we identified state regulatory plans suitable for analysis was whether there were likely to be adequate state-level reporting of the data for the study. The availability of reports was determined initially from the National Association of Regulatory Utility Commissioners (NARUC) publication, *Utility Regulatory Policy in the United States and Canada: Compilation 1992-1993*, September 1993, Tables 59 and 79. We initially identified states that had required LECs to report state specific data, particularly with respect to Access Lines (AL) and Gross Plant Additions (GPA).

We found that state-level data is reported in many ways that do not always allow the data to be compared either among different jurisdictions or over time. Even those jurisdictions that nominally required LECs to report state-specific data adopted many different forms of reporting and levels of detail, particularly over the entire 1986-92 period that was the focus of the study. This condition proved to be the biggest hurdle to empirical research and accounted for several incentive regulation states being dropped from the analysis.³

We developed a good data set for seven states: California, Michigan, New York, Oregon, Texas, Tennessee and Washington. One of the study group, Rochester Telephone in New York, is not a Bell Company. The telephone companies in these states are all operating under

¹ Timothy Tardiff and William Taylor, "Telephone Company Performance Under Alternative Forms of Regulation in the U.S." National Economic Research Associates, (Cambridge, MA), September 1993, pages 32-33.

² Tariff and Taylor, *op cit.*, page 27.

³ Where data for a telephone company in any given year was missing we compared that company's results only to the "Other RBOC" data set for the same years.

an alternative regulation scheme that could have an effect on rates of investment in the network infrastructure.

The other empirical studies used data for several years, but it is not always clear how many years were included in each analysis. Those portions of the studies which examined different rates of technology deployment (e.g., digital switches, signalling system 7, etc.) probably do not analyze years prior to 1989 or 1990, because that is when the FCC first began to require LECs to report their deployment of specific technologies. We attempted to obtain data back to 1986.

We used the reported state-specific levels of Gross Plant Additions (GPA) in each year, in order to obtain the most direct measure of the Bell company or other LEC's actual investment activity. The Tardiff-Taylor and University of Nebraska studies utilized a measure of the *net* book investment reported by the LECs. This measure, however, is influenced by the plant depreciation rates adopted by the regulator.⁴ The rate of capital recovery directly affects the LEC's *net* investment simply as a matter of the accounting effect between the rates of depreciation and the LEC's plant investment, regardless of the form of regulation applied to tariffed prices.

We used only a simple classification of various incentive schemes. The other studies noted above classified the *types* of incentive regulation (e.g., "banded rate of return"). The multiple classifications may possibly introduce an added subjective element in the analyses. Individual plans adopted by specific state regulatory commissions almost always have one or more unique feature.⁵ We identified a set of states that had adopted clearly defined incentive regulation schemes, without attempting to decompose the plans by type.

The classification of incentive plans was developed initially from NARUC's *Utility Regulatory Policy in the United States and Canada: Compilation 1992-1993, op cit.*, Table 168. NARUC specifies whether a state plan involves a service classification scheme (e.g., competitive and non-competitive); flexible pricing of selected services; revenue or earnings sharing; and some form of price cap. The classification of state alternative regulation plans was checked against National Regulatory Research Institute, "Update to the Maine and Missouri Reports on Alternative Regulation Plans in Telecommunications," NARUC, June

⁴ Tardiff-Taylor added the current year's depreciation expense to net book investment. *Op Cit.*, p. 32. This measure still mixes regulatory practices concerning capital recovery with the telephone company's own investment in new plant.

⁵ For example, the Tardiff-Taylor "class" of states with "deregulation" must refer only to Nebraska, because that is the only state that has adopted such extensive decontrol of monopoly LEC operations.

1993.

In order of priority, the factors used to identify potential states for the study were:

- (1) The apparent availability of state-specific data.
- (2) The regulatory plans that offered the LEC the greatest freedom with respect to its own decisions about new investment.⁶ These were states that had apparently not adopted an explicit earnings sharing mechanism.
- (3) Regulatory plans that incorporated some sort of a "price cap" mechanism, or a form of pricing flexibility that covered basic exchange calling services, because these plans might provide the LEC with incentives to invest where it had a greater assurance of being able to adjust prices in order to recover the investment.
- (4) States with an "incentive plan" that provided pricing flexibility only for limited discretionary services or toll services; these jurisdictions were eliminated from the study because such limited pricing flexibility should have only the weakest relationship to network investment strategies.

Items (1) and (4) resulted in the elimination of a number of the states that were initially identified.⁷ The resulting set of data for the state specific study is attached to this appendix.

The data show variations from year to year. This is to be expected because the numbers of customers, demand and overall telecommunications traffic are growing at different rates among the telephone companies. Local and regional economic conditions may affect the timing of growth rates as well. In order to attempt to isolate these conditions, which have no obvious relationship to local regulatory conditions, we utilized the gross plant investment made by the LEC as (1) a function of its growth in access lines, and (2) over multi-year periods that smoothed clearly anomalous conditions. The underlying policy question is whether the form of regulation stimulated investment activity over and above the amount the LEC would spend

⁶ We theorized that a plan without an earnings sharing mechanism provides the LEC with a more dramatic change in incentives compared to traditional rate of return regulation, other things being equal. See, generally, Jean-Jacques Laffont and Jean Tirole, *A Theory of Incentives in Procurement and Regulation*, MIT Press, 1993.

⁷ Alabama, Illinois and Virginia were eliminated because the alternative regulation plans were deemed not to offer strong incentives affecting investment; in Illinois Bell's case because the public utility commission decision was partially overturned by an appeals court after some delay.

to satisfy growth. In states with higher access line growth, relatively more of the investment activity is likely to be attributed to growth, and less to network modernization, than in another state where the LEC invested the same unit amount while experiencing lower growth. On the other hand, even relatively low investment by a LEC in a given year might lead to very high unit growth rates if, for example, the number of access lines it served stayed the same or even declined.

We first applied a standard cost for each access line added per year. The cost component was \$1300, consistent with several reference sources.⁸ The LEC's investment net of the cost assigned to access line growth is considered to be investment in modernizing the network. The modernization share of gross plant additions per access line were computed for the seven test states separately and for all seven combined, and then tested for the same data for all Bell companies and jurisdictions that were not part of the study set.

We have been unable to conclude that the form of regulation or the "strength" of a particular incentive scheme has a definable effect on investment. This result is consistent with the analysis in the Report and appropriate for financial theory. But there are many limitations in the data. Some of the other factors that could have affected investments in particular areas are identified in the report but could not be isolated. Therefore, this analysis also demonstrates again that regulators need to devote great care in defining (a) what type of behavior they expect from LECs subject to alternative regulation, and (b) what data will be available to measure whether the desired behavior is achieved.

⁸ For example, *see* Calhoun, *Wireless Access and Local Telephone Network* (1992), quoted by Huber in "The Enduring Myth of the Local Bottleneck," March 14, 1994. p. 27 and footnote 100. The normal range of investment costs for standard landline access loops is between \$1200 and \$2000 per line.

Summary Study Data

GROSS PLANT ADDITIONS DEVOTED TO MODERNIZATION – 1987 TO 1992

DATA	RBOC Total	LECs Studied	RBOCS Not Studied	Pacific Bell California	Ameritech Michigan	Rochester Tel. New York	US West Oregon	SW Bell Texas	SC Bell Tennessee	US West Washington
AL86	95,334,094	27,241,846	68,092,248	12,219,777	3,933,526	415,345	885,846	6,274,700	1,804,057	1,708,595
AL87	98,228,585	27,801,084	70,427,501	12,596,299	4,011,143	419,147	907,493	6,257,000	1,853,293	1,756,709
AL88	100,994,477	29,226,939	71,767,538	13,569,207	4,099,027	437,892	978,481	6,408,300	1,951,453	1,782,579
AL89	103,656,590	30,038,057	73,618,533	13,986,907	4,141,840	449,906	989,201	6,692,700	1,948,453	1,829,050
AL90	107,392,188	31,246,549	76,145,639	14,525,240	4,250,631	461,551	1,015,277	6,933,200	2,010,418	2,050,232
AL91	112,554,986	33,183,251	79,371,735	15,606,586	4,498,048	473,375	1,048,586	7,134,000	2,224,635	2,198,021
AL92	114,989,650	34,215,856	80,773,794	16,208,368	4,611,976	488,966	1,082,497	7,393,200	2,224,814	2,206,035
Count	7	7	7	7	7	7	7	7	6	7
CAGR	3.17%	3.87%	2.89%	4.82%	2.69%	2.76%	3.40%	2.77%	2.66%	3.62%
Addl AL 87	2,894,491	559,238	2,335,253	376,522	77,617	3,802	21,647	allocated (17,700)	86 estimated 49,236	48,114
Addl AL 88	2,765,892	1,425,855	1,340,037	972,908	87,884	18,745	70,988	151,300	98,160	25,870
Addl AL 89	2,662,113	811,118	1,850,995	417,700	42,813	12,014	10,720	284,400	(3,000)	46,471
Addl AL 90	3,735,598	1,208,492	2,527,106	538,333	108,791	11,645	26,076	240,500	61,965	221,182
Addl AL 91	5,162,798	1,936,702	3,226,096	1,081,346	247,417	11,824	33,309	200,800	214,217	147,789
Addl AL 92	2,434,664	1,032,605	1,402,059	601,782	113,928	15,591	33,911	259,200	179	8,014
GPA86	8,171,729	5,753,470	2,418,259	n/a	530,608	65,283	117,179	1,050,681	250,972	
GPA87	14,148,579	6,856,880	7,291,699	1,607,387	524,960	64,448	130,331	783,170	295,038	333,413
GPA88	14,339,678	3,118,133	11,221,545	1,248,664	508,852	66,683	137,369	644,973	286,424	225,168
GPA89	13,308,194	3,191,418	10,116,776	1,243,710	489,816	45,313	119,858	759,679	301,453	231,589
GPA90	14,513,036	3,877,402	10,635,634	1,654,913	556,190	54,395	127,064	883,757	306,045	295,038
GPA91	14,549,022	3,990,012	10,559,010	1,653,514	539,385	68,610	156,315	892,292	360,960	318,936
GPA92	14,464,043	4,003,067	10,460,976	1,601,556	500,305	47,758	194,962	968,804	334,706	354,976
Net GPA 87	10,385,740	6,129,871	4,255,870	1,117,909	424,057	59,505	102,190	806,180	231,032	270,864
Net GPA 88	10,744,018	1,264,521	9,479,497	(16,116)	394,603	42,315	45,085	448,283	158,816	191,537
Net GPA 89	9,847,447	2,136,965	7,710,482	700,700	434,159	29,695	105,922	389,959	305,353	171,177
Net GPA 90	9,656,759	2,306,362	7,350,397	955,080	414,762	39,257	93,165	571,107	225,491	7,501
Net GPA 91	7,837,385	1,472,299	6,365,086	247,764	217,743	53,239	113,013	631,252	82,478	126,810
Net GPA 92	11,298,980	2,660,681	8,638,299	819,239	352,199	27,490	150,878	631,844	334,473	344,558
Rm GP/AL 87	108.94	225.02	62.50	91.48	107.81	143.27	115.36	128.48	128	158.53
Rm GP/AL 88	109.38	45.48	134.60	(1.28)	98.38	100.95	49.68	71.64	85.69	109.03
Rm GP/AL 89	97.50	73.12	107.44	51.64	105.92	67.81	108.25	60.85	156.47	96.03
Rm GP/AL 90	93.16	76.78	99.84	68.28	100.14	87.25	94.18	85.33	115.73	4.10
Rm GP/AL 91	72.98	47.12	83.59	17.06	51.23	115.35	111.31	91.05	41.03	61.85
Rm GP/AL 92	100.39	80.18	108.83	52.49	78.30	58.07	143.89	88.57	150.35	156.76
* based upon previous year's AL count										
TOTAL 87-89	\$315.82	\$343.62	\$304.54	\$141.84	\$312.10	\$312.03	\$273.29	\$260.98	\$370.23	\$363.59
TOTAL 90-92	\$266.53	\$204.08	\$292.27	\$137.83	\$229.67	\$260.67	\$349.38	\$264.95	\$307.10	\$222.71
% CHANGE	-15.6%	-40.6%	-4.0%	-2.8%	-26.4%	-16.5%	27.8%	1.5%	-17.1%	-38.7%
First Cost	Loops	Line cards	Total							
	1200	100	1300							