years.[41] With a term of one year, price caps are identical to the FCC's variant of ROR regulation. Under either regime, the firm gets to retain the benefits of its efficiency gains for only one year. Consequently, efficiency incentives are about 14 percent, the same as before. With longer terms, the efficiency incentives increase. They are about 35 percent for a 4-year term and about 71 percent for a 10-year term.

In choosing among these pure price-cap plans, the significantly greater efficiency incentives of long-term plans must be traded off against the greater risk. The academic literature provides some guidance in making this trade-off. Richard Schmalensee, in his paper "Good Regulatory Regimes," examined the trade-off between risk and efficiency incentives in price-cap plans. He concluded that for a range of plausible parameter values, efficiency incentives are (on average) optimized at approximately the 63 percent level.[42] Below 63 percent, incentives may be inadequate and yield too low a level of efficiency. Above 63 percent, the risk may be excessive; *i.e.*, the expected losses from misspecifying the productivity commitment (too high or too low) may outweigh the incremental efficiency gains from sharper incentives. Schmalensee's analysis suggests that regulators should not adjust the pricing formula until 8 to 10 years in the future.[43]

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[41]See Appendix for discussion of the methods used to measure incentives.

[42]Schmalensee's paper does not explicitly address the term of the price-cap plan, but it does focus on the trade-off between risk and efficiency incentives.

The cited result applies to the case in which the regulator maximizes consumer benefit subject to allowing the firm to have non-negative expected profits (over and above its cost of capital). Higher efficiency incentives (86 percent) would be optimal if the regulator sought to maximize overall economic welfare, including the firm's profits as well as consumer benefits.

[43]Prices would, however, be adjusted each year in accordance with the original formula. Other adjustments may also be appropriate on an ongoing basis. For example, we recommend annual reviews to streamline regulation of additional services and remove services from regulation, as competition evolves.

Table 1 Efficient Incentives Under Pure Price Caps (No Earnings Sharing)	
Term of Plan	Efficiency Incentives Relative to Unregulated Markets
(Years)	(Percent)
1	14
2	21
3	29
4	35
5	42
6	49
7	55
8	62
9	67
10	71

It appears from the Schmalensee analysis that regulators have been excessively cautious in reviewing the pricing formulae after 3 to 5 years. Reviewing the pricing formulae less frequently could greatly increase efficiency incentives and would allow the consumer dividend to be higher.

2. Sharing Mechanisms

Regulators have further dulled the efficiency incentives under price caps by having additional "sharing" mechanisms incorporated into their price-cap plans.[44] Under sharing mechanisms, the firm gets to keep only a fraction of efficiency gains — even during the initial price-cap period. The higher the sharing percentages, the less are the efficiency incentives and the less are the efficiency gains. Sharing is inherently counter-productive when the term of the price-cap plan is too short, and incentives are too diluted to start with — as is the case with all existing price-cap plans.[45] This applies, in particular, to the FCC's price-cap plan for LECs. The FCC plan is thus a hybrid between pure price caps and ROR regulation.

Table 2 shows the marginal efficiency incentives under price regulation with 50/50 sharing of earnings. The table applies only to firms whose earnings are in the sharing range. Under the FCC hybrid price-cap plan for LECs, 50/50 sharing occurs if the LEC's earnings are between 12.25 and 16.25 percent per year.[46]

As the table shows, a 4-year hybrid price regulation plan with 50/50 sharing has approximately 18 percent of the efficiency incentives provided in unregulated competitive markets. These incentives only slightly exceed those under 1-year ROR regulation.

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[44]For example, under the LEC price-cap plan, LECs choosing a 3.3 percent productivity offset must share with their customers 50 percent of earnings between 12.25 percent and 16.25 percent, and 100 percent of earnings above the 16.25 percent level. Under the California plan, earnings above a benchmark rate of return, set 150 basis points above the expected rate of return, are shared equally between shareholders and ratepayers. In Kentucky, there is 50/50 sharing on return on capital between 11.61 and 13.11 percent. Above 13.11 percent, South Central Bell retains 25 percent and returns 75 percent to ratepayers.

[45]More generally, sharing plans have all the same infirmities as ROR regulation (see footnote 1), but to a lesser degree.

[46]If LECs elect to lower prices further to a level reflecting a higher 4.3 percent productivity offset, they may retain 50 percent of the earnings between 13.25 and 17.25 percent.

Table 2 Efficient Incentives Under Hybrid Price Caps with a 50/50 Sharing Mechanism	
Term of Plan	Efficiency Incentives Relative to Unregulated Markets
(Years)	(Percent)
1	8
2	11
3	15
4	18
5	22
6	25
7	29
8	32
9	35
10	37

Without sharing, efficiency incentives would be at the 35 percent level (as shown in Table 1), far below the optimal level of 63 percent. The sharing mechanism goes in the wrong direction and reduces efficiency incentives. Sharing mechanisms have the additional drawback of making it more difficult to streamline regulation of selected services (see Section D).

3. Timing of Consumer Dividend

Under longer-term price-cap plans, the Consumer Dividend could be higher than under current plans. However, the incumbent regulatory commission may be unable to bind future commissions (or even itself) not to renegotiate the price-cap plan prior to the end of the term. Without a binding commitment, the firm most probably would be strongly opposed to a

commitment to a large Consumer Dividend. This has not been a problem with short-term price-cap plans, because the Consumer Dividends have been moderate (commensurate with expected efficiency gains). This would be a more serious concern with long-term plans, having large Consumer Dividends.

A solution to this problem is to have the Consumer Dividend automatically increase in the latter part of a long-term plan.[47] The higher levels of the Consumer Dividend would then be paid only after future regulatory commissions demonstrate good faith by not renegotiating the plan.

For example, suppose that the term of the price-cap plan were 10 years. The Consumer Dividend for the first 5 years could be set at a level appropriate for a 5-year plan.[48] At the end of the 5 years, the plan would *not* be renegotiated. However, there could be an automatic increase in the Consumer Dividend. The increase would apply until the end of the 10-year term. The increase in the Consumer Dividend could amount to some fraction of the expected incremental efficiency gains from having a 10-year plan instead of a 5-year plan.

D. Streamlined Regulation of Selected Services

Another way to enhance efficiency incentives is to streamline regulation in selected markets. Streamlined regulation would resemble the regulation of AT&T in the interstate jurisdiction for Baskets 2 and 3.[49] It would also resemble interstate regulation of other long-

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[47]The offset (over and above the Consumer Dividend) to reflect *historical* productivity may be constant during the term of the plan. Alternatively, it may move up or down to reflect expected *exogenous* changes in productivity; *e.g.*, as a result of competition.

[48]The plan would also have an adjustment for inflation and for expected future productivity growth under ROR regulation. The adjustment for future productivity growth might differ from previous productivity growth in order to reflect expected further developments.

[49]In its 1991 Interexchange Competition proceeding, the Commission determined that sufficient competition existed in certain market segments to allow some regulatory relaxation for all "basket 3" business services except analog private line services. The business services basket (basket 3) includes ProAmerica, WATS, Megacom, SDN, other switched services, voice grade and below private line service, and other private line service. 6 F.C.C. Rcd at 5881 & n.4. The Second Report and Order in Docket 90-132, released May 14, 1993, extended to all AT&T 800 services, except 800 directory assistance, the "further streamlined regulation" that was granted to most of AT&T's other large business services under an earlier order in the same proceeding. Price-cap ceilings, bands and rate floors no longer will apply to these services, which previously constituted AT&T's "basket 2" services under price-cap regulation. 8 F.C.C. Rcd 3668.

distance carriers. Under streamlined regulation, tariffs generally require no cost support and are rapidly approved.[50] In markets under streamlined regulation, the firm's earnings are not subject to regulatory oversight, and the firm has no guarantee of a fair return. The selected markets are subject to 100 percent of the efficiency incentives of unregulated competitive markets (instead of 18 or 35 percent).[51]

In this discussion, we assume that prices in markets not subject to streamlined regulation (unstreamlined markets) are governed by price regulation. During the period of the price-regulation plan, the prices in unstreamlined markets are limited by specific constraints; *e.g.*, price caps. They are unaffected by whether other services have streamlined regulation. As a result, streamlining of regulation in selective markets is much easier under price regulation than under ROR regulation. The regulator must, of course, ensure that customers in streamlined markets are not subject to abuse of market power. However, he or she need not be concerned about the effect of streamlined markets on customers in *unstreamlined* markets. Price regulation, itself, affords the latter customers adequate protection. Indeed, that protection is an important benefit of price regulation (with no sharing mechanism).[52]

Also, during the period of the incentive-regulation plan, costs need not be allocated between streamlined and unstreamlined markets. So long as there is no sharing mechanism, prices during the period would be unaffected by cost allocations. Foregoing cost allocations can greatly expedite the process of streamlining regulation, as streamlining becomes appropriate in particular market.[53]

For these reasons, we focus below on potential abuse of market power (e.g., excessive rates and inadequate quality of service) in the markets to be streamlined. Under streamlining,

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[50]In the August 18, 1993 order (CC Docket 93-36), streamlining federal tariffing requirements for nondominant interexchange carriers' tariffs may be filed on one day's notice (see 8 FCC Rcd 6752).

[51]Efficiency incentives are no more than 35 percent under the current interstate price-cap plan, which has a four-year term. Incentives could be increased above 35 percent by adopting a longer-term plan.

[52] This benefit is lessened if the incentive-regulation plan provides for sharing of earnings during the period of the plan. That lessening is an additional drawback of sharing mechanisms — over and above the dilution of incentives discussed in the previous subsection.

[53]Regulators do, however, need to consider forward-looking costs when it comes time to renew the plan. They need to make sure that under the new plan, revenues in unstreamlined markets can cover the costs (including a fair return to capital) attributed to unstreamlined markets.

regulatory actions are no longer relied upon to prevent such abuse. The regulator must, therefore, ensure *in advance* that abuse of market power will not be a problem. That is the basis for selecting which markets are to be subject to streamlined regulation.

Firms in industrial markets almost invariably have some degree of market power.[54] The regulator must, therefore, develop a standard for "cognizable" market power. That is, regulation in a market can be streamlined if and only if the firm's market power in that market does not exceed the cognizable limit.[55]

Selecting an appropriate standard involves making a trade-off between the potential losses from abuse of market power under streamlined regulation versus the costs and infirmities of unstreamlined regulation. In particular, the regulator must determine whether the potential abuse of market power under streamlined regulation outweighs the 65 to 82 percent reduction of efficiency incentives (from 100 percent to 35 or 18 percent) under unstreamlined regulation.

Where customers have no reasonable alternatives to the company's service, unstreamlined regulation is likely to be warranted. The large reduction in efficiency incentives, while unfortunate, must be endured. On the other hand, if customers *do* have reasonable alternatives, the benefits of unstreamlined regulation are unlikely to justify the large loss of efficiency associated with such regulation — not to mention the large direct costs of unstreamlined regulation.

E. Standard for Noncognizable Market Power

We would suggest the following standard for streamlined regulation of a service:

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[54]Market power may, for example, derive from product differentiation or from the firm's location.

[55]We use the term "cognizable," since the above standard is analogous to "cognizable interest" under the Commission's broadcast/cable cross-ownership rules; e.g., FCC rules on broadcast ownership (ownership of broadcasting stations by other broadcasting stations or by newspapers) barring "cognizable" interests (47 C.F.R. §73.3555).

(a) Competitors offer comparable services at comparable (or lower) quality-adjusted prices;[56] and

(b) Competitors can "reach" customers who account for a certain sizable fraction of total demand; *e.g.*, a competitor's network passes the customer or a competitor can reach the customer via LEC facilities.[57]

Conditions (a) and (b) together define our proposed standard for noncognizable market power. The standard is *not* a market-share test and is far preferable to a market-share test. Our proposed test is whether customers have reasonable alternatives. A market-share test relates to how many consumers have actually adopted particular alternatives. Market-share tests have limited value as indices of market power.[58] In addition, using market-share tests for regulatory purposes perversely creates incentives for the incumbent firm to fail; *i.e.*, not to compete effectively. Declining market share often results from high cost of providing the service and/or poor quality of service. Favorable regulatory treatment based on reduced market share, therefore, rewards the firm for high cost and low quality; it punishes the firm for low cost and high quality.

We would further recommend that LECs be afforded substantial freedom to disaggregate services; *e.g.*, within a defined geographic area or jurisdiction in order to create a service that will pass the test for streamlined regulation. When regulation in a market is streamlined, the competitor naturally loses the protection of (industry-specific) regulation.[59] However, the competitor enjoys a large compensating benefit; namely, the LEC cannot cross-subsidize the streamlined service. In general, any price reductions to meet competition reduce the LEC's

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[56]Wireless service would, for example, satisfy this criterion if transmission quality were comparable to that of landline service and the price were only slightly higher The slightly higher price would be balanced (quality-adjusted) by the advantage of portability.

[57]This condition is intended to apply to outside plant and spectrum licenses. It is *not* necessary for competitors to have substantial excess capacity in central office equipment or circuit equipment, which can be quickly added as justified by demand.

Conditions (a) and (b), together imply that legal barriers to entry have been removed. They also imply that where equal access is necessary to compete, it has been provided.

[58]*See*, for example, Franklin M. Fisher, *Industrial Organization, Economics, and the Law*, edited by John Monz, The MIT Press, Cambridge, MA, 1991, p. 15.

[59]The competitor, however, continues to enjoy the protection of the antitrust laws, including the right to bring private antitrust suits.

bottom line. This lost revenue cannot be made up by raising prices in unstreamlined markets.[60]

In general, the public interest is best served if regulators let competition freely operate in the market. The company should be allowed to disaggregate the part of a service that becomes competitive. By so doing, price-cap constraints eliminate any incentive to cross-subsidize and free the regulator from being forced to play the awkward role of referee in competitive markets. Absent streamlined regulation, the critical competition will take place in the regulatory hearing room — not in the market. That is unfortunate, since it is competition in the market that benefits consumers. Competition in the market yields lower prices, higher quality, and more rapid innovation. Competition in the hearing room yields ever more imaginative legal arguments. The regulatory process also facilitates cartelization of the industry, since price cutting must be disclosed and is subject to regulatory delay.

We propose that the standard for "sizable fraction" in Condition (b) be a fixed number. The number would be determined in a generic regulatory proceeding. The same number would apply to all services and markets being considered for streamlined regulation. Each individual service or market would then be tested separately to determine whether it meets the standard.

A generic standard for "sizable fraction" is appropriate, since streamlining should occur in many small markets. Determining a separate standard for each market or service would result in lengthy delays and large costs without providing commensurate customer benefits. The same result would occur if the standard was complex and/or unspecific; then a regulatory proceeding would be required for each case to determine the applicability of the standard. On the federal level, the administrative problems of developing separate standards for each service or market would be completely unmanageable. The goal should be to achieve rough justice, while strictly limiting administrative costs and delays.

[60]Prices in unstreamlined markets will, of course, change over time, in accordance with regulatory policies. Allowable price changes do not, however, increase as a result of the firm's incurring losses in unstreamlined markets.

If our proposed standard were appropriately implemented, some markets, mainly in large metropolitan areas, would qualify for streamlined regulation today.[61] Regulation of much of the transport market would be streamlined shortly after collocation is implemented. As competition evolves, more and more markets would be subject to streamlined regulation. Within 5 years, regulation should be streamlined in many LEC markets. Within 10 years, a sizable portion of LEC revenues should be subject to streamlined regulation. Indeed, events of the past few months portend an acceleration of competition that may require markets to be streamlined even more rapidly.

From an economics perspective, the further step of deregulation in selected markets would be constructive.[62] If tariffs need not be filed, price cuts can be confidential. Each firm would then have greater opportunity to seize additional business before competitors became aware of the price cuts. The ultimate result would be more intense competition and lower prices to consumers.

F. Market Segments

Because of transactions costs and/or installation costs, competitors may be able initially to compete most effectively for only certain customers (based on characteristics such as size and/or location).[63] Consequently, some customers may have more and better competitive alternatives than others. For this reason, appropriate standards for streamlined regulation in some markets may differ for differently situated customers. More generally, competition may progress at varying paces in different market segments. That situation can best be handled by allowing the LEC to offer services that are similarly targeted to particular groups of customers. Those services may then meet the criteria for streamlined regulation. Remaining customers would continue to enjoy the protection of unstreamlined regulation.

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[61]For example, Centrex has long faced stiff competition from PBXs. Special access services (particularly broadband) should also be afforded streamlined regulation in certain geographic areas.

[62]We do *not* address federal or state *legal* concerns that may be raised by deregulation.

[63]For example, some competitors, particularly providers of wireless services, may be able to serve small customers profitably.

It makes no sense for regulators to prevent LECs from offering services targeted to certain customers on the grounds of unreasonable discrimination. Where transactions and installation costs so indicate, the existing procompetitive regulatory policies already ensure that some customers will get lower rates than other customers. The key issue is whether the LEC will have an opportunity to compete effectively in all segments of the markets.

G. Discretionary Services

Arguments similar to the above can be made with regard to "discretionary" services. If the company raises the price of such a service, customers can exercise their discretion by refusing to buy it. This option limits the customers' loss. In addition, the prospect of lost sales makes it less likely that the company will raise rates in the first place.

For these reasons, the benefits of unstreamlined regulation of discretionary services are unlikely to justify the large reduction in efficiency incentives. We would therefore recommend streamlining the regulation of such services. Regulators would generally determine which services are discretionary, though there might be legislative guidelines. From an economics perspective, services should be classified as discretionary if their demands are sufficiently elastic to effectively discipline prices.

New telecommunications services that supplement existing offerings are generally discretionary and should be subject to streamlined regulation, for the reasons just discussed. This does not apply, however, to new services that displace basic services, which are then discontinued. Such new services are likely to be as essential as the services that they displace. Streamlined regulation of such a service would therefore be appropriate only if competitive suppliers provide comparable services and can reach customers who constitute a sizable fraction of demand.

Streamlining the regulation of new services (without earnings regulation) has the special advantage of encouraging successful innovations. It allows the firm to retain all the profits resulting from such innovations. Consumers also benefit through the availability of new alternatives. ROR regulation, on the other hand, limits the firm's upside potential, while imposing the risk of disallowances if the new service turns out to be unsuccessful.

Customers of discretionary and new services already have alternatives. Hence, the streamlining of regulation need not wait for any future expansion of competition. It should be done right away in order to bring customers the benefits of streamlined regulation.

IV. EFFICIENT PRICING

For decades, regulators have required telephone companies to price services in an economically-inefficient manner. Two important types of inefficient pricing are discussed in this section: (1) the overpricing of long-distance services (including long-distance access) in order to underprice local services; and (2) underdepreciation of plant.

Both types of inefficient pricing are politically popular but economically destructive. Such pricing may have made sense in an earlier era, when telephone penetration was low and competition was not present. Today, however, it simply constitutes bad public policy and will become increasingly counterproductive as competition intensifies over the next decade.

The challenge in this area is not to find a better way to price telecommunications services. That is easy. The challenge is to find a *politically feasible* way to phase out inefficient pricing practices. This goal must be accomplished before competition is ubiquitous in order to avoid serious dislocations; *e.g.*, very rapid price increases for consumers and/or financial distress for the incumbent or its competitors.

A. Overpricing of Long-Distance Services in Order to Underprice Local Services

Long-distance services are priced far above the levels that would obtain in a fully-competitive environment; *e.g.*, in a perfectly contestable market. Most local services, especially local usage (which is often free — *i.e.*, no usage-based charges), are priced below competitive levels.[64] The original rationale for such pricing was to promote universal service. However, universal service was, for all practical purposes, achieved long ago. Furthermore, the experience with Subscriber Line Charges (SLCs) in the 1980s demonstrates that telephone

[64]For further discussion, *see* John T. Wenders, *The Economics of Telecommunications* (Ballinger Publishing Company: Cambridge, Massachusetts), 1987.

penetration can continue to increase, even though local access rates increase.[65] We can reasonably conclude that the rationale for the current inefficient pricing is outmoded.

The excess of price above marginal cost of interstate services amounts to at least $7.0 billion per year. The excess of price above marginal cost is even greater at the state level — $11.3 billion per year.[66] Reducing interstate and intrastate long-distance rates would greatly stimulate demand for long-distance services and provide additional value to customers. On the other hand, the compensating increases in local rates would have little effect on telephone penetration. The loss of penetration could be further reduced through more efficient means such as targeted (*i.e.*, means-tested) subsidies and/or offering lifeline service (low fixed monthly charge, high charges for originating local usage).

While inefficient pricing is undesirable in any event, it becomes unfeasible when there is competition. Competitors, even if they are not efficient, can easily undercut rates that are padded by regulators to include noneconomic costs. For example, interstate switched access rates are constructed to recover substantial costs from all the following categories:

- loop costs
- costs of the main distributing frame
- capital costs on underdepreciated plant

None of these costs depend on the amount of switched access that the LEC provides. Competitors can provide access, while avoiding some or all of these costs.

The inevitable consequence of this inefficient pricing is that competitors take customers away from the LECs — not because the competitors are necessarily more efficient or better at meeting customer needs — but because regulators do not require them to recover

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[65]Part of the reason for this is that usage of long-distance services is widespread. The benefits of the SLCs in the 1980s, that is, lower long-distance prices, were received by a group nearly as broad as the group paying the SLCs. *See, e.g.*, Alexander Larson, Thomas Makarewicz and Calvin S. Monson, "The Effect of Subscriber Line Charges on Resident Telephone Bills," *Telecommunications Policy* (December 1989).

[66]*See* Jeffrey H. Rohlfs and Calvin S. Monson, *The $20 Billion Impact of Local Competition in Telecommunications*, prepared for the United States Telephone Association, July 16, 1993.

noneconomic costs in their prices.[67] As LECs lose business, they lose the contribution they formerly received from that business. LECs must then, in order to cover their costs (including a fair return on cost of capital), raise other rates, to customers who do not have alternatives. The end result is neither equitable nor efficient.

The harms from inefficient pricing can be mitigated to some extent by allowing LECs to have downward pricing flexibility in competitive markets. However, as competition intensifies LECs are unlikely to be able to cover their costs unless they can make partially compensatory rate increases in certain less-competitive markets.

If LECs are *not* permitted to raise prices in less competitive markets, they will not be able to cover their costs. Ultimately, they will be unable to attract capital, and their portion of the telecommunications infrastructure will deteriorate.

Imposing charges on competitors who do *not* interconnect with the local exchange may be viable (even desirable) in the short term. However, regulatory monitoring is inherently difficult, especially if there are many small competitors. Enforcement is therefore likely to be troublesome. Consequently, imposing charges on competitors who do not connect with the local exchange is unlikely to be a satisfactory long-term solution to the problem of inefficient pricing.

In 1984-1985, the FCC considered whether to impose such charges on "bypassers" and decided that such a plan was not workable. At that time, the Commission acknowledged that the existing pricing structure provided artificial incentives for bypass, but it regarded the problem as non-urgent at that time.[68]

The problem is urgent now. Well-funded competitors with ambitious growth plans already operate in a number of large cities. The Commission has recently ordered collocation and interconnection for switched and special access. As competition for transport services evolves, many customers will establish business relations with LEC competitors. That will facilitate the growth of end-to-end bypass, as well as competition for transport services.

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[67]Symmetric regulation of the incumbent and its competitors, on the other hand, allows only the most efficient firms to prosper and thereby improves industry performance. Streamlined regulation, where appropriate, also allows only the most efficient firms to prosper and *maximizes* industry performance.

[68]For further discussion of this issue, see D. Weisman and D. Lehman, "The Industry That Cried Wolf," *Public Utilities Fortnightly* (July 1, 1993).

The Commission should immediately begin to phase out regulatory policies whose social welfare benefits no longer outweigh the growing costs of inefficient pricing. Such action will become progressively more difficult over time, as competitors grow. Competitors will make sizable investments and hire employees, based on the current rate structure. The dislocations resulting from restructuring will become more serious and more difficult to remedy, the longer that restructuring is delayed.

Eliminating inefficient pricing entails rate reductions in long-distance services (including long-distance access) and rate increases for local services. On the interstate level, increasing subscriber line charges (SLCs) is one way to accomplish these goals. Unfortunately, increasing the SLC for residents and single-line business turned out to be politically volatile when it was attempted in the mid-1980s. Yet, in the long term, the best way for regulators to ameliorate the problems of inefficient pricing is to give LECs some discretion to price in response to market conditions, rather than subject to inflexible regulatory rules. This might involve raising local rates where appropriate and in accordance with regulatory guidelines, while lowering long-distance access charges.[69] Political sensitivities can be assuaged to some extent, but not entirely, by restructuring prices gradually over time. Gradual restructuring will be possible only if it begins very soon.

In the meantime, the Commission should take measures to ensure that inefficient pricing does not lead to inefficient competition; *i.e.*, that inefficient pricing does not attract competitors who can survive only because of regulators' set prices of competitive services far above cost in order to underprice other services. Such policies should be competitively neutral and minimize inefficiencies.

Part of the solution is to have a general policy that includes an appropriate and clearly-defined contribution element in the charge for interconnection. However, end-to-end bypass from the customer to the interexchange carrier does not involve interconnection. Consequently, an interconnection charge would not apply to end-to-end bypass. An interconnection contribution element could, therefore, solve only a small part of the problem. Additional measures are necessary to avoid encouraging uneconomic end-to-end bypass.

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[69]In this paper, we do not address the legislative alternative of raising taxes to support low rates for local telephone services.

In the long term, regulatorily-imposed inefficient pricing harms consumers of noncompetitive services. If customers have competitive alternatives, they will ultimately adopt them if the cost savings are appreciable. As competition grows, more and more customers will have competitive alternatives. The burden of inefficient pricing will, therefore, have to be borne by a smaller and smaller group of customers, who will each have to pay increasing amounts. Before that process goes too far, rates should be restructured to eliminate inefficient pricing.

B. Underdepreciation of Plant

For decades, regulators have not allowed telephone companies to depreciate plant as rapidly as the value of the plant declines. Depreciation methods do not reflect the rapid obsolescence of high-tech equipment.

Table 3 compares depreciation of LECs with that of a variety of other high-tech firms. LECs have far less accumulated depreciation than any of the other firms. Furthermore, LECs take less annual depreciation expense (as a fraction of gross plant) than any of the other firms; so the problem is getting worse, not better.

Table 3
Annual Depreciation and Amortization Expense and Accumulated Depreciation and Amortization as a Percent of Gross Property, Plant and Equipment for Local Exchange Carriers (LECs) Versus Other High-Tech Companies
1991

				As a Percent of Gross Property, Plant and Equipment	
	Depreciation and Amortization Expense	Accumulated Depreciation and Amortization	Gross Property, Plant and Equipment	Depreciation and Amortization Expense	Accumulated Depreciation and Amortization
	(Thousand Dollars)			(Percent)	
	(1)	(2)	(3)	(4) (1)÷(3)	(5) (2)÷(3)
All Reporting LECs	$16,910,113	$93,642,648	$246,449,644	6.9%	38.0%
Apple Computer, Inc.[a]	204,400	588,000	1,036,000	19.7	56.8
Xerox Corporation	695,000	2,690,000	4,795,000	14.5	56.1
Texas Instruments Inc.	590,000	2,007,000	4,361,000	13.5	46.0
Digital Equipment Corporation (DEC)[b]	827,000	3,651,000	7,429,000	11.1	49.2
Hewlett-Packard Co.	624,000	2,616,000	5,961,000	10.5	43.9
McDonnell Douglas Corp.	499,000	2,948,000	5,255,000	9.5	56.1
International Business Machines (IBM)	5,150,000	28,100,000	55,678,000	9.3	50.5
American Telephone & Telegraph Co. (AT&T)[c]	3,568,000	21,203,000	39,892,000	8.9	53.2
Litton Industries, Inc.	219,834	1,214,988	2,525,439	8.7	48.1
General Electric Co.	2,654,000	13,741,000	32,073,000	8.3	42.8
Corning Incorporated	231,300	1,380,100	2,809,700	8.2	49.1
MCI Communications Corp.	776,000	3,987,000	9,684,000	8.0	41.2
The Boeing Co.	826,000	5,070,000	10,600,000	7.8	47.8
Westinghouse	360,000	2,544,000	5,070,000	7.1	50.2
The Dow Chemical Company	1,465,000	11,888,000	20,663,000	7.1	57.5

[a]Data based on Fiscal Year Ending September 27, 1991.
[b]Data based on Fiscal Year Ending June 29, 1991.
[c]AT&T is partially regulated by the FCC.
Source: All Reporting LECs: FCC, *Statistics of Communications Common Carriers*, 1991/1992 Edition, pp. 8, 38 and 41.
Other Companies: *Moody's Industrial Manual* and *Public Utility Manual*, 1992 and *Standard & Poor's Corporation Records*, 1993.

One might try to justify the low LEC depreciation rates on the basis of their investment in long-lived outside plant. However, that argument is becoming more and more strained, as high-tech fiber-optic cable is replacing low-tech copper cable. Indeed, embedded copper wire becomes worthless in an economic sense when fiber optics is deployed. Fiber optics can offer services (such as voice, data applications, and a whole host of broadband services) and requires substantially less maintenance than copper. Furthermore, fiber optics is digital and can be interconnected less expensively to digital switches and digital PBXs. All these considerations argue in favor of rapid depreciation of embedded copper plant.[70]

Depreciation in the cable television industry is relevant in this regard. Cable companies have a large fraction of their plant investment in outside plant. Like LECs, cable companies have substantial embedded investment in copper (coaxial cable) and are gradually upgrading to fiber. Table 4 shows depreciation of cable multiple system operators (MSOs) that do not have sizeable holdings other than cable companies.[71] All the cable MSOs in the table depreciate plant about two to three times as rapidly as LECs.[72]

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[70]For further discussion of this issue, *see* Michael J. Marcus and Thomas C. Spavins, "The Impact of Technical Change on the Structure of the Local Exchange and the Pricing of Exchange Access: An Interim Assessment," unpublished draft. *See also* Jeffrey H. Rohlfs, Charles L. Jackson, Harry M. Shooshan III and Susan W. Leisner, *'Miles to Go': The Need For Additional Reforms In Capital Recovery Methods*, presented at the National Economic Research Associates, Inc. Telecommunications In A Competitive Environment Seminar, Scottsdale, Arizona, April 12-15, 1989.

[71]We attempted to include as many large cable MSOs as possible in the table. However, many large MSOs, such as TCI, ATC (subsidiary of Time Warner) and Cox are excluded, since they have sizable noncable holdings.

[72]Cable MSOs have relatively little *accumulated* depreciation, since they are growing so rapidly and much of their plant is relatively new.

Table 4
Annual Depreciation and Amortization Expense and Accumulated Depreciation and Amortization as a Percent of Gross Property, Plant and Equipment for Local Exchange Carriers (LECs) Versus Cable TV Companies
1991

				As a Percent of Gross Property, Plant and Equipment	
	Depreciation and Amortization Expense	Accumulated Depreciation and Amortization	Gross Property, Plant and Equipment	Depreciation and Amortization Expense	Accumulated Depreciation and Amortization
	(Thousand Dollars)			(Percent)	
	(1)	(2)	(3)	(4) (1)÷(3)	(5) (2)÷(3)
All Reporting LECs	$16,910,113	$93,642,648	$246,449,644	6.9%	38.0%
Comcast	164,299	340,628	845,452	19.4	40.3
Comcast/Philadelphia, L.P.	16,218	38,207	97,205	16.7	39.3
TCA Cable	34,007	119,649	229,279	14.8	52.2
Galaxy Cable M.L.P.	7,479	26,608	53,531	14.0	49.7
Adelphia	79,427	211,599	580,370	13.7	36.5

Note: Accumulated depreciation for cable companies is derived from Gross Plant less Net Plant.

Source: All Reporting LECs: FCC, *Statistics of Communications Common Carriers*, 1991/1992 Edition, pp. 8, 38 and 41.
Cable Companies: Paul Kagan Associates, Inc., *The Cable TV Financial Databook*, June 1992, pp. 58 and 72.

Underdepreciation of LEC plant amounts to a huge sum. To put the LEC industry on the same sound footing as the unregulated firms in Table 3, regulators would need to authorize approximately $25 billion of depreciation.[73]

Underdepreciation is best understood as a giant regulatory Ponzi game. Regulators in the past have (with the best of intentions) chosen not to fund the cost of telephone service fully, but to pass part of the costs on to the next generation; the next generation of regulators

[73]The additional depreciation described above is the total amount, while the figures calculated in the previously cited Monson-Rohlfs study are annual costs. This figure includes both federal and state depreciation components.

passed an even larger burden on to the next generation; and so forth. So long as this game can be continued indefinitely, all generations of ratepayers benefit.

Unfortunately, however, the Ponzi game ends, and the bubble bursts, when competition becomes widespread in the industry. Prices in competitive markets are limited by the costs of competitors. They cannot be raised simply because regulators in the past chose not to fully fund the cost of telephone service in their generation. As more and more markets become competitive, the only choices will be to raise rates to the shrinking group of monopoly ratepayers or to deny the company a fair return on its investment. The former is inequitable and politically unacceptable; while the latter reduces LECs' access to capital markets and inevitably leads to a decline in their portion of the telecommunications infrastructure. To avoid this unpleasant choice, current regulators must deal with the $25 billion problem they inherited from past Ponzi players — before competition becomes ubiquitous.

1. Depreciation Under Price Caps

Increasing the rate of depreciation of an item of plant raises expenses in the short term, but decreases expenses farther in the future. Under ROR regulation, the company is afforded the opportunity to recover its prudently-incurred expenses, including depreciation. Consequently, increases in depreciation under ROR regulation translate directly into price increases in the short term. The company generally has the incentive to petition for higher depreciation rates. Higher depreciation expense, together with increased revenue to match the higher depreciation, increases cash flow in the present and reduces risk in the future. On the other hand, regulators have resisted price increases, because of the political implications of increasing short-term prices.

The incentives differ under price caps. Under pure price regulation, increases in depreciation rates are usually *not* treated as exogenous cost increases, which are flowed through to customers. Consequently, increases in depreciation do not generally translate into price increases. They simply lower the company's reported earnings. Consequently, the company has much less incentive to petition for increases in depreciation rates. Under price

caps with a sharing mechanism, part of the depreciation increase flows through to customers in the form of higher prices. Part flows through to stockholders in the form of lower reported earnings. The company's incentives to seek increases in depreciation are still less than under ROR regulation. Because of these incentives, it is hardly surprising that the problem of underdepreciation actually has gotten (slightly) worse under price caps.

Treating increases in depreciation rates as "exogenous" cost increases would be better than the *status quo.* However, that policy would simply restore the pre-price-cap incentives, which also led to underdepreciation.

The FCC recently took action to reduce unnecessary bureaucracy in the process of prescribing depreciation rates;[74] yet this action cannot realistically be expected to solve the problem of underdepreciation. If a price-cap LEC unilaterally increases its depreciation rates, it suffers a financial loss (lower reported earnings) with no commensurate compensation.[75] Consequently, it has little incentive to do so. As a result, the problem of underdepreciation is likely to persist.

Further measures are required to solve the problem of underdepreciation. The best approach is for regulators and LECs to agree on an ambitious specified schedule for reducing the value of assets on the regulatory books as part of a price-cap plan. The devaluation of assets would not correspond directly to rate increases and would therefore reduce the company's reported earnings. The Commission would therefore (*ceteris paribus*) need to make concessions elsewhere in the plan in order for the plan to be acceptable to the company.

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[74]FCC, In the matter of Simplification of the Depreciation Prescription Process, CC Docket No. 92-296, *Report and Order* (adopted September 23, 1993, released October 20, 1993).

[75]The financial loss is manifest when the price-cap plan is renewed. Regulators must set the terms of the new plan so that the LEC has the opportunity to recover and earn a fair return on the rate base. However, the rate base is reduced if the LEC previously unilaterally increased depreciation rates. As a result, the LEC would have less bargaining leverage to negotiate favorable terms for the new price-cap plan.

V. PRICING FLEXIBILITY

For purposes of this section, we assume that the firm's prices, other than for selected services subject to streamlined regulation, are limited by some overall constraint; *e.g.*, price caps or a ROR constraint. We then consider what limitations should be placed on the firm's freedom to restructure rates *within* the overall constraint.

Under ROR regulation, regulators generally have the power to set prices for each individual rate element. In practice, however, the firm has typically been afforded some pricing flexibility within the overall earnings constraint.

Pricing flexibility is more explicit under price regulation. The firm is free to restructure rates, so long as the new rates satisfy specific constraints. In the FCC plans, price-cap constraints must be satisfied individually for each of several specified baskets of services. In addition, changes in average prices for "services" (which are precisely defined sets of rate elements) must be within specified bands.

In analyzing pricing flexibility, we first note that the firm almost surely understands its costs and demand better than the regulator does. Consequently, rates set by the firm are much more likely to reflect actual (relevant) costs and actual market conditions than would rates set by regulators. This argues in favor of giving the firm some discretion in setting rates to achieve the economic benefits of more efficient pricing.

Absent sufficient competition or regulatory constraints, the firm may have an incentive to choose some rates that are not in the public interest. A firm with market power would obviously have the incentive to set overall rates too high, apart from regulatory constraints. Here, however, we are assuming that the firm's overall rates are limited by price-cap constraints. Thus, the issue is whether the firm, in meeting that overall constraint, has an incentive to set some rates too high and others too low.

An important academic result bears on this issue. In 1979, Vogelsang and Finsinger[76] analyzed the regulatory regime under which only the firm's overall price level is constrained;

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[76]I. Vogelsang and J. Finsinger, "A Regulatory Adjustment Process for Optimal Pricing by Multiproduct Monopoly Firms," *Bell Journal of Economics* 10(1), 1979: 157-71; see also Ingo Vogelsang, *Price Cap Regulation of Telecommunications Services: A Long-Run Approach* (Santa Monica, Calif.: The RAND corporation, 1988), vii-ix, 24-25.

that is, there are no additional constraints on individual prices or sets of prices (*e.g.*, baskets). Vogelsang and Finsinger found that the firm under this regulatory regime will tend, in the long-term, to price efficiently. Ultimately, the prices that maximize economic efficiency also maximize the firm's profits. Thus, regulatory intervention in setting individual rates cannot be justified on the basis of general economic efficiency

There are, however, two considerations that might lead to regulatory intervention. First, economically-efficient rates might not be politically palatable. In this regard, we presume that regulators will limit the firm's freedom to raise local rates and lower long-distance rates. We have previously argued that regulators should, indeed, give LECs discretion to raise local rates where appropriate, while lowering long-distance access charges. One cannot, however, realistically propose that the firm be given unlimited freedom to restructure these rates as it chooses, without regulatory oversight.

At the local level, political concerns have led regulators in the past to price residential service low relative to business services and to price basic services low relative to discretionary services. Political constraints, apart from the SLC, are less binding at the interstate level, and the FCC has more practical freedom to price efficiently.

In all the above cases, it should be understood that restricting the firm's freedom to set rates diminishes economic efficiency in the long term. Rates set by regulators will not accurately reflect relevant economic costs and market conditions. In order to assuage political concerns, regulatory intervention imposes costs in terms of reduced productivity and makes the U.S. economy less competitive.

Competitive concerns also provide a legitimate rationale for regulatory intervention. The incumbent firm, if unconstrained, may choose to charge too high a price for interconnection services and other essential inputs used by competitors. Regulators must limit the firm's freedom simultaneously to raise these prices, while lowering output prices.

Similarly, the firm might choose to price services that are subject to intense competition below marginal cost if it could simultaneously raise prices of services that are subject to

less intense competition.[77] Regulators may, therefore, choose to limit the firm's freedom to restructure rates in this way.

Under ROR regulation, these concerns would be addressed on a case-by-case basis. Under price caps, undesired price restructuring is limited by baskets and bands. Creating the following set of baskets would suffice to meet the above-mentioned goals:

1) Politically sensitive services and interconnection charges;

2) Other noncompetitive services;

3) Emerging competitive services; and

4) Competitive services (subject to streamlined regulation, not subject to price-cap regulation).

Pricing flexibility would be explicitly limited in Basket 1. Individual rate elements could be governed by specific regulatory guidelines. As previously discussed, economic efficiency and productivity will be greater, the fewer "politically-sensitive" services are included in this basket.

Interconnection prices should be set so as to avoid the possibility of a vertical price squeeze. In general, if charges to competitors for use of essential facilities embody a contribution over and above cost, the same contribution should be imputed to the incumbent firm's output prices.[78]

Basket 4 services should not be subject to price regulation. They should receive streamlined treatment, as previously discussed. Competitive forces, rather than regulation,

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[77]This is a traditional regulatory concern, but it is far from clear that the firm has any profit incentive to price in such a way. *See* Michael A. Einhorn, ed., *Price Caps and Incentive Regulation in Telecommunications*, Kluwer Academic Publishers, 1991, p. 234. In any event, regulatory policies that prevent the firm from pricing below marginal cost do no economic harm, apart from regulatory delays and administrative costs.

[78]This rule is consistent with static profit maximization. It limits the regulated firm's freedom to sacrifice profits in a way that reduces the scope of competition. For fuller discussion of this issue, *see* William J. Baumol, *Deregulation and Residual Regulation of Local Telephone Service,* AEI Studies in Telecommunications Deregulation (March 3, 1993) and William J. Baumol and J. Gregory Sidak, *Toward Competition in Local Telephony,* (Cambridge, MA, MIT Press, 1994), Chapter 7, "The Pricing of Inputs Sold to Competitors," pp. 93-116. When effective competition exists for all inputs in a particular market, no facilities are essential.