New Wine and Old Wineskins
Modeling Effects of Competition and Expanded Interconnection in the Local Exchange

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ALTERNATIVE COSTING METHODS PROJECT

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List of Participants in the Alternative Costing Methods Project

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State Regulators	NARUC
Regional Holding Companies	Ameritech Bell Atlantic BellSouth NYNEX Pacific Telesis Southwestern Bell US West
Large Independents	Centel GTE Southern New England Telephone Sprint Local Telecom Division
Small Telephone Representative	NTCA
Interexchange Carrier	AT&T
Switch Manufacturers	Northern Telecom Philips Kommunikations
Harvard	

Assisting with *public* data:

Federal Communications Commission
National Exchange Carrier Association

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- Department of Health and Human Services
  - National Library of Medicine
- Department of State
  - Office of Communications
- Federal Communications Commission
- General Services Administration
- National Aeronautics and Space Administration
- National Security Agency
- U.S. General Accounting Office
- United States Postal Rate Commission

US West

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List of Acronyms

Acct	Account
ARMIS	Automated Reporting Management Information System
AP	Alternative Provider
BOC	Bell Operating Company
C&WF	Cable and Wire Facilities
C&WF Cat 1	Exchange Line Cable and Wire Facilities Excluding Wideband
C&WF Cat 1.3	Exchange Subscriber or Common Lines Cable and Wire Facilities
C&WF Cat 2	Wideband and Exchange Trunk Cable and Wire Facilities
C&WF Cat 3	Interexchange Cable and Wire Facilities
C&WF Cat 4	Host/Remote Cable and Wire Facilities
CAP	Competitive Access Provider
Cat	Separations Category
CCL	Carrier Common Line
COE	Central Office Equipment
COE Cat 2	Tandem Switching Equipment
COE Cat 3	Local Switching Equipment
COE Cat 4.12	Exchange Trunk Circuit Equipment
COE Cat 4.13	Exchange Line Circuit Equipment Excluding Wideband
COE Cat 4.2	Interexchange Circuit Equipment
COE Cat 4.23	All other Interexchange Circuit
COE Cat 4.3	Host/Remote Circuit Equipment
DS1	Digital Signal 1
DS3	Digital Signal 3
FCC	Federal Communications Commission
IXC	Interexchange Carrier
LATA	Local Access Transport Area
LEC	Local Exchange Carrier
NECA	National Exchange Carrier Association
NTS	Non-Traffic Sensitive
PCS	Personal Communications Services
POP	Point of Presence
RIC	Residual Interconnection Charge
SLC	Subscriber Line Charge
USF	Universal Service Fund
USOAR	Uniform System of Accounts Revised

I. Introduction

Changes in Regulation

Regulation of telephone companies in the United States has historically focused on a few objectives. Those have included ubiquitous and universal service, reasonable service at reasonable rates, minimal geography-based disadvantages to customers, and opportunity for companies to recover costs that have been reasonably incurred. The telephone industry has traditionally concurred in these objectives, and cooperated in their achievement.

The methods of regulation used to achieve those objectives have, until recently, been fairly standard across the country. The methods included provider of last resort, keeping prices low for basic service, averaging prices across customer classes and across geographic areas, and service-at-cost regulation practiced in the form of rate of return regulation. Regulation has also used ways of providing economic support to telephone companies that have high costs, are small, or serve rural areas. The traditional regulatory and industry methods for pursuing public policy objectives were based on how the industry historically operated — regulation operated in the context of the Bell-Independent partnership.[1]

Recent changes in the economy and the telephone industry have prompted regulation to add to its objectives. Recent additions would include infrastructure development, development of local and national economies, economic efficiency, and fair treatment of competitors. These new objectives have been accompanied by new methods, including adopting alternative forms of regulation, facilitating competition, increasing interconnection rights for customers and competitors (called expanded interconnection), and obtaining more detailed cost information, especially on services that are thought to be competitive.

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[1] Carol L. Weinhaus and Anthony G. Oettinger, *Behind the Telephone Debates*, Ablex Publishing Corp., Norwood, NJ, 1988, p. 10.

Like the biblical adage about new wine bursting old wineskins, the new and the old in regulation appear to be on a collision course in many instances. Rate of return regulation implies a right to cost recovery that is inconsistent with the profit and loss potential inherent in competition. Competition makes rateaveraging and support mechanisms problematic, and decreases revenues that can be used to support provider-of-last-resort obligations. Support mechanisms are also made more difficult by expanded interconnection, because the mechanisms are often tied to the use of one or more specific pieces of the network.

Purpose and Overview

The purpose of this paper is to examine what happens to some of the traditional objectives and methods of regulation when the environment has changed — specifically, the introduction of expanded interconnection and competition.[2] For purposes of this analysis, competition is considered to occur when customers that would traditionally use the telephone company obtain at least some of their telephone services from someone else. An example of this might be

[2] For more information on regulatory actions on interconnection, see CC Docket No. 91-141, *In the Matter of Expanded Interconnection with Local Telephone Company Facilities*, FCC Order No. 91-159, June 6, 1991; Case 29469 and Case 88-C-004, *Proceeding on Motion of the Commission to review Regulatory Policies for Segments of the Telecommunications Industry Subject to Competition, and Proceeding on Motion of the Commission to review Telecommunications Industry Interconnection Arrangements, Open Network Architecture, and Comparably Efficient Interconnection*, New York Public Service Commission *Order Accepting in Part and Rejecting in Part Comparably Efficient Interconnection (CEI) Task Force Recommendations*, issued June 7, 1990; and Case 28425, *Proceeding on Motion of the Commission as to the Impact of the Modification of Final Judgement and the Federal Communications Commission's Docket 78-72 on the Provision of Toll Service in New York State*, New York Public Service Commission *Opinion and Order on Pooling, Collocation and Access Rate Design*, issued May 29, 1992; CC Docket No. 85-229, *Amendment of Sections 64.701 of the Commission's Rules and Regulations (Third Computer Inquiry)*, FCC *Third Report and Order*, July 3, 1986; CC Docket No. 91-346, *Intelligent Networks*, FCC *Notice of Inquiry*, 6 FCC Rcd 7256, December 6, 1991.

cellular.[3] Throughout the paper, service and facility providers, other than the traditional telephone companies, are called alternative providers (APs). The traditional telephone companies are simply referred to as local exchange companies (LECs).

There is a mismatch between expanded interconnection, competition, and the data available to analyze them. Interconnection can occur at several points, and network functionalities can be substituted individually or in groups.[4] So by its nature, expanded interconnection disaggregates LEC services into their facility components. A central reason for interconnection is to encourage competition. From the competitive view, services rather than facilities are the focus. However, existing nationwide public data is facility-based rather than services-based. These facility data arise from pre-competitive regulatory reporting requirements and the existing detail differs from the manner in which facilities may be disaggregated for interconnection. To look at the services-based view requires additional data on both the traditional telecommunications industry and their competitors as well. Focusing on how LECs get access to customers, route traffic, and transport traffic can be misleading because APs may use different systems and functionalities to provide customers with similar services.

This paper resolves this conflict and simplifies the competition and interconnection issues by focusing on competition for three groups of network facilities. Those are interoffice facilities (interoffice trunking and tandem switching), end office switching, and loop (including distribution and feeder).

[3] The word "competition" is used in a very broad sense in this paper. It only implies that some degree of substitution occurs, and does not say anything about intensity, durability, or effectiveness of the competition.

[4] Hatfield identified twelve points of possible interconnection, listed in **Figure 38, Appendix A**. Each of these points would be a communications node where customers and competitors could enter and exit the network. **Figure 38** also lists pieces of the network that could be substituted on an individual basis or by groups. See Hatfield Associates, "Open Network Architecture: A Promise Not Realized," Boulder, CO, April 4, 1988, Figures 1-5, pp. 27-37.

This research does not take sides in the policy debates on the issues. Rather, it illustrates places where collisions between the old and the new may or may not occur. The goal is to aid those making policy decisions.

Not all issues related to competition and expanded interconnection are examined in this paper. **Figure 1** lists those issues that are modeled in the paper. See **Figure 2** for a list of other issues.

The paper is organized as follows:

- **Section II** explains the traditional network, costing, and business arrangements, and the emerging arrangements. It also presents the relative magnitude of the different issues. This section provides a framework for the models in **Section III.**

- **Section III** presents the results of the models.

- **Section IV** provides the conclusion.

Figure 1
Interconnection and Competition Issues Modeled

Cost Recovery and Allocation

- Contrast of embedded cost and incremental cost.
- Effect of LEC loss of minutes of use on jurisdictional allocations and embedded cost per minute.
- Effect of competition on basic service rates, Subscriber Line Charges (SLC), and Carrier Common Line (CCL) rates.
- Investment required for modernizing old equipment.

Averaging

- Potential rate deaveraging by geographic area and type of customer.

Supports

- Residual Interconnection Charge's (RIC's) size and composition, alternative recovery methods for the costs, and possible effects on transport rates.
- Effect of loop competition on the Universal Service Fund (USF) distributions.

Figure 2
Interconnection and Competition Issues Not Modeled

Some of the issues raised by competition and interconnection that are not modeled in this paper are:

Possible Effects on Cost Recovery and Allocation

- What is the cost of standing ready to serve?
- What happens to the LECs' cost of capital, and what are the effects?
- What are the effects on the economic value of the LECs' networks?
- What would be the effects of having all LECs pay access to each other?
- Should LECs pay access to the competitors?
- How would the effects on LEC costs correspond to price changes under price caps?
- What are the effects of a two-tariff structure: an unbundled tariff and a bundled tariff?
- What are the effects of price flexibility for the LECs? What are the effects of no price flexibility?
- What are the effects of competition for special access?

Impacts on Support Mechanisms

- What would be the effects of forcing or allowing APs to join the National Exchange Carrier Association (NECA)?
- What would be the effect on average schedule companies?
- What happens to Dial Equipment Minutes weighting?
- What are alternatives to the current support mechanisms?
- What are alternative ways of funding the current support mechanisms?
- What happens to long term support for the NECA CCL pool?

Other Regulatory Questions

- How should regulation respond to strategic investment?
- How should a transition to less competition be handled should competition fail?
- Who must offer interconnection, under what conditions, and in what time frame?
- How will standards be set, and how will they evolve?
- Should there be local equal access? What would be the effects?
- Who will control the telephone numbers?
- What are the effects of customer churn between local service providers?
- How will captive customers be protected? How will anticompetitive actions be policed?
- What happens to dual jurisdiction?
- What is the effect of a unified state/federal tariff? What is the effect of jurisdictionally different tariffs?
- How should jurisdiction be determined?
- What happens if jurisdiction cannot be determined?
- Should APs be required to offer equal access for long distance?
- What happens to interexchange competition if one or more interexchange carriers gain an advantage because of the distances their POPs are from the LEC end office?
- How would classifying interconnectors as local subscribers, access customers, or LECs affects LEC revenues?

II. Development of Interconnection and Competition Issues

Traditional Arrangements — Network

Figure 3 shows the traditional LEC network facilities. The end user is connected to the LEC's end office by a local loop. If the end user subscribes to basic exchange service, the loop provides the link to the end office switch. Local exchange traffic is switched to other end users (sometimes through another end office in the same exchange) and long distance traffic is routed to an interexchange carrier's (IXC) point of presence (POP).[5] Traffic to an IXC's POP may be routed one of the following three ways:

- Directly to the POP.
- To an end office at the serving wire center (the local wire center where the IXC has its POP) and then to the POP.
- Through a tandem switch to the serving wire center before being delivered to the POP.

If the end user subscribes to a dedicated channel, known as private line service or special access, the channel may follow those same routes, but would be connected through cross-connect systems rather than switches.

Traditional Arrangements — Costing

Figure 4 shows how jurisdictional separations categorizes the various telephone facilities. An overview of the costing process, from accounting to cost recovery, is shown in **Figure 39, Appendix A.** Investment in wire and fiber optic cable is classified as cable and wire facilities (C&WF). The investment is further

[5] In the case of intraLATA traffic, the long distance traffic may be routed directly by the LEC rather than entering a non-LEC IXC's network.

Figure 3
Local Exchange Carrier Network: Facilities

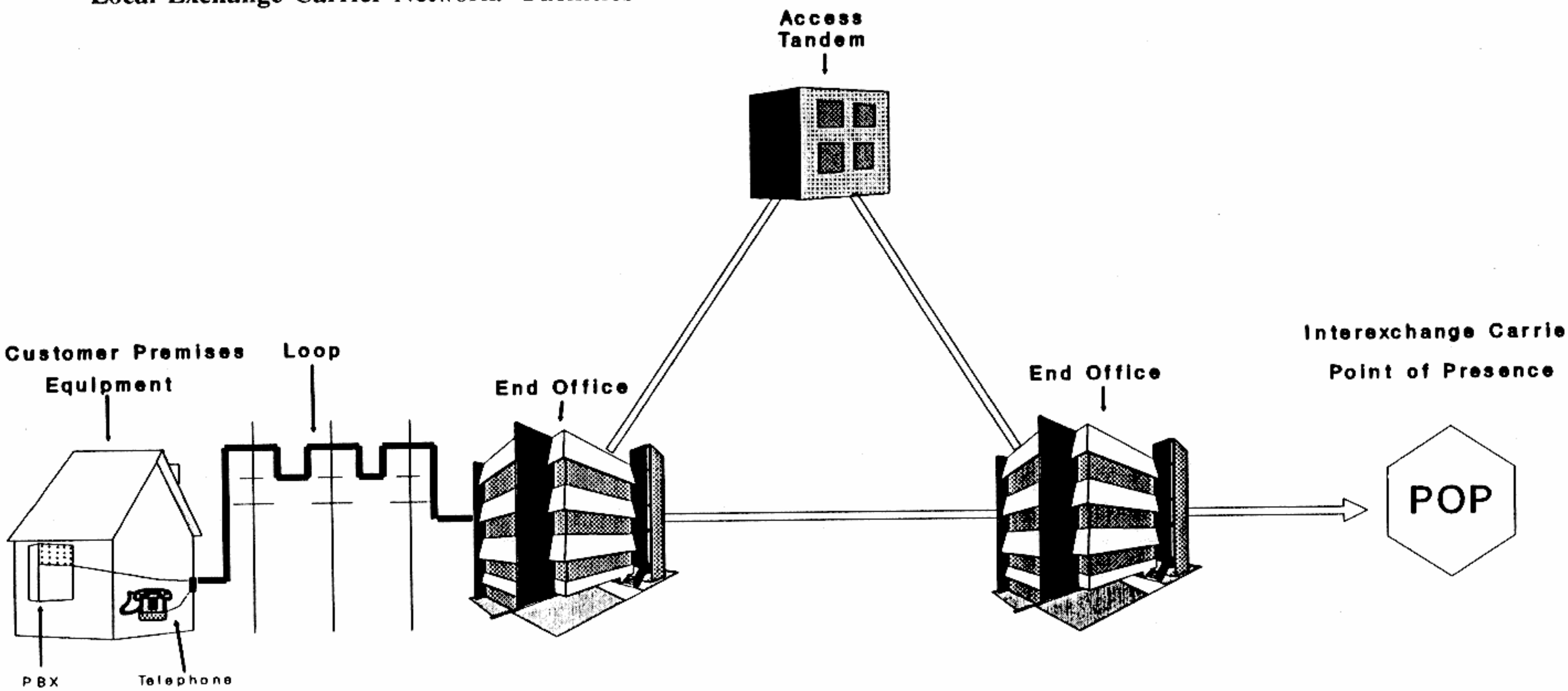
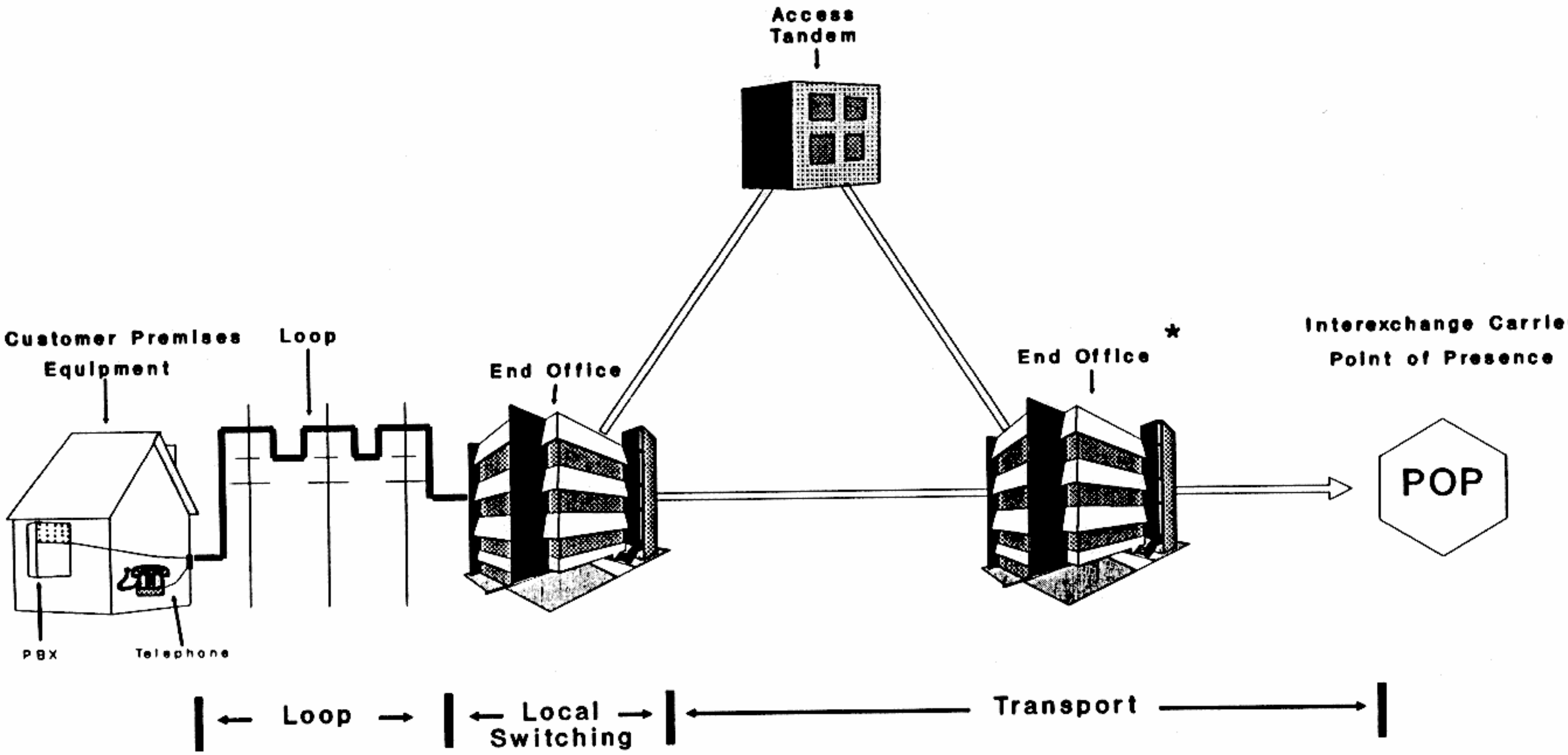


Figure 4
Local Exchange Carrier Network: Jurisdictional Separations Categories



Loop: C&WF Cat 1, COE Cat 4.13

Local Switching: COE Cat 3

Transport: C&WF Cat 2, 3, 4, COE Cat 2, 4.12, 4.2, 4.3

* The local transport traffic is not switched at this End Office. Therefore, COE Cat 3 costs are not included in Transport.

subdivided into facilities associated with the local loop, exchange trunk, interexchange trunk, and host/remote.

Facilities associated with tandem and end offices are classified as central office equipment (COE). They are further categorized as operator systems, circuit, end office switch, and tandem. Circuit equipment is further broken down into portions used with local loops, trunks, and dedicated circuits.[6]

Figure 39, Appendix A, indicates that the last step in the costing process is rate development — Part 69 for interstate.[7] How the Part 69 process recovers these telephone facility costs for switched services is shown in **Figure 5**.[8] **Figure 6** indicates how Part 69 recovers costs for special access. For companies that are rate of return regulated, rates are determined for each of the Part 69 categories by dividing cost by demand. Initial rates were set this way for price cap companies, and now these companies can adjust rates within the bounds defined by the indices and bands established by the Federal Communications Commission (FCC).

The FCC has pending a decision on how to structure rates for local transport.[9] Currently, all rates for local transport are equal on a per unit of

---

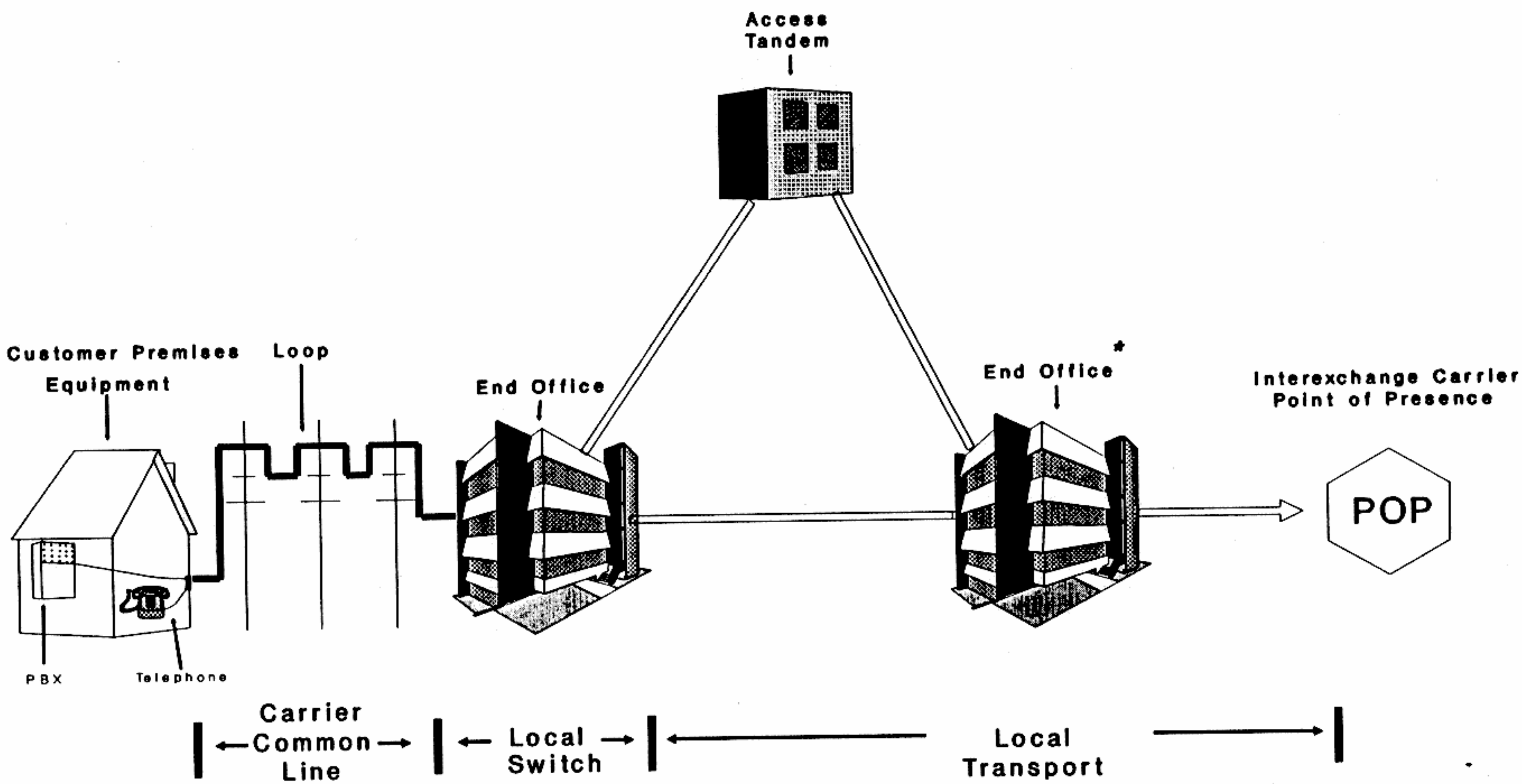
[6] The C&WF and COE categories mentioned are simplifications of the actual separations categories in Part 36.

[7] 47 C.F.R. Part 69 (1991).

[8] Currently, switched transport is assessed on a per-minute-of-use basis. Mileage is measured from the end office serving the IXC to the end office serving the customer.

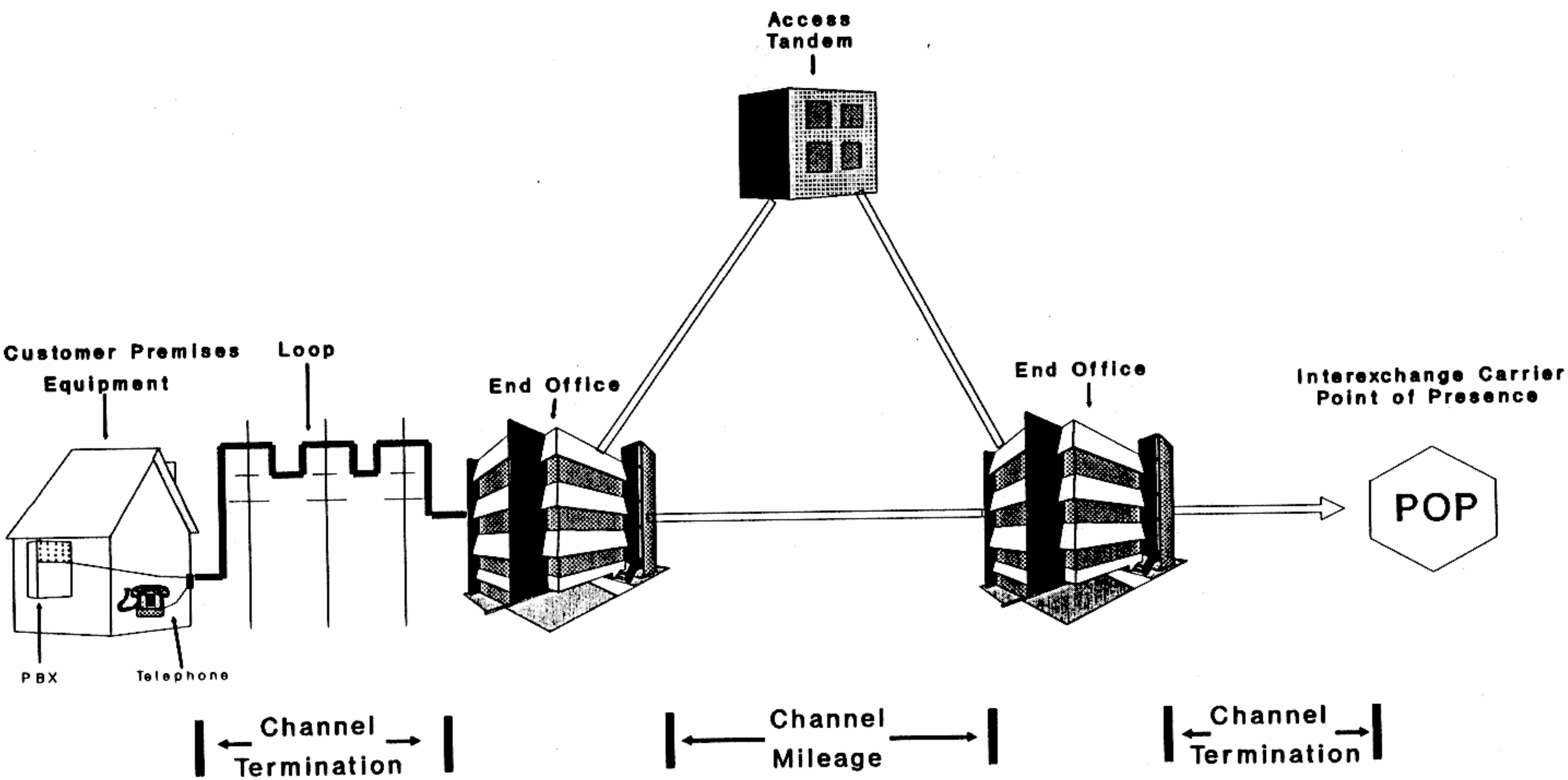
[9] CC Docket Nos. 78-72 and 91-213, *Transport Rate Structure and Pricing*, FCC *Order and Further Notice of Proposed Rulemaking*, 6 FCC Rcd 5341, August 30, 1991. Local transport is one of the elements of switched access. It covers the use of interoffice facilities.

Figure 5
Local Exchange Carrier Network: Current Interstate Switched Access Rate Categories



* The local transport traffic is not switched at this End Office. Therefore, COE Cat 3 costs are not included in the Local Transport rate.

Figure 6
Local Exchange Carrier Network: Current Interstate Special Access Rate Categories



traffic basis, and are averaged within each study area (generally all of the area in a state served by the LEC). The FCC has proposed to differentiate these rates between common and dedicated services. This issue was the subject of an earlier paper for this project.[10]

In general, state procedures for developing rates vary among states, but the most popular method has been fully distributed cost.[11] Using some measure of incremental cost has also been popular.[12] Many states do not have established policies for setting rates.[13]

Traditional Arrangements — Business

IXCs purchase LEC services based on access tariffs. These are wholesale tariffs designed specifically for access.[14] End users traditionally purchase services through retail tariffs, such as local exchange tariffs and message toll tariffs. Both

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[10] Carol Weinhaus and Mark Jamison, *Examples of Modeling -- Transport and Other Issues*, Program on Information Resources Policy, Harvard University, Cambridge, MA, July 21, 1991.

[11] Fully distributed cost methods distribute all accounting costs to services. Costs are either directly assigned, or allocated using some reasonable allocation factor.

[12] Incremental cost methods generally use computerized process models to estimate the extra costs that would be caused by some change in output, or to estimate the cost of replacing facilities.

[13] Mark A. Jamison, "Developing Regulatory Costing Methodologies for Evolving Markets," *Proceedings of the Bellcore and Bell Canada Industry Forum on Telecommunications Costing in a Dynamic Environment*, April 1988, pp. 60 and 63a; and Sandy Ibaugh, "Report on Intrastate Cost Allocations Database Development," Report to the Committee on Communications of the National Association of Regulatory Utility Commissioners, July 1991.

[14] In some jurisdictions, end users and information service providers may also purchase services based on the access tariff.

end users and IXCs purchase dedicated circuits based on special access tariffs.[15] Prices for functionally similar services generally vary among tariffs. LECs handle each others' traffic on a contractual basis. The exception is when a LEC acts as an IXC. In this case the LEC acting as an IXC may pay access.

Emerging Arrangements — Network

Up to this point, this section has described the traditional arrangements. The next two portions of the section discuss how these arrangements may look with competition and expanded interconnection. This information provides a foundation for analyzing how these arrangements affect traditional regulatory methods.

Figure 7 illustrates one view point of competition in the communications network in the future. End users served by LEC metropolitan area end offices may also connect to landline AP networks — currently fiber rings. The landline AP networks may be connected to IXC POPs, to the LEC end office, and to wireless AP systems, such as Personal Communication Service (PCS) or cellular systems.

LEC end users in suburban areas may be connected to a landline AP (probably cable television) network that also connects to IXC POPs, to the AP network in the metro areas, and to wireless AP systems. LEC end users in rural exchanges may be able to connect to similar AP networks directly, or through PCS.

[15] Some jurisdictions have a separate tariff for end users called a private line tariff. Some LEC services are provided under contract rather than through a tariff. One example would be interconnection services provided to cellular companies.

Figure 7
Competition: One Viewpoint

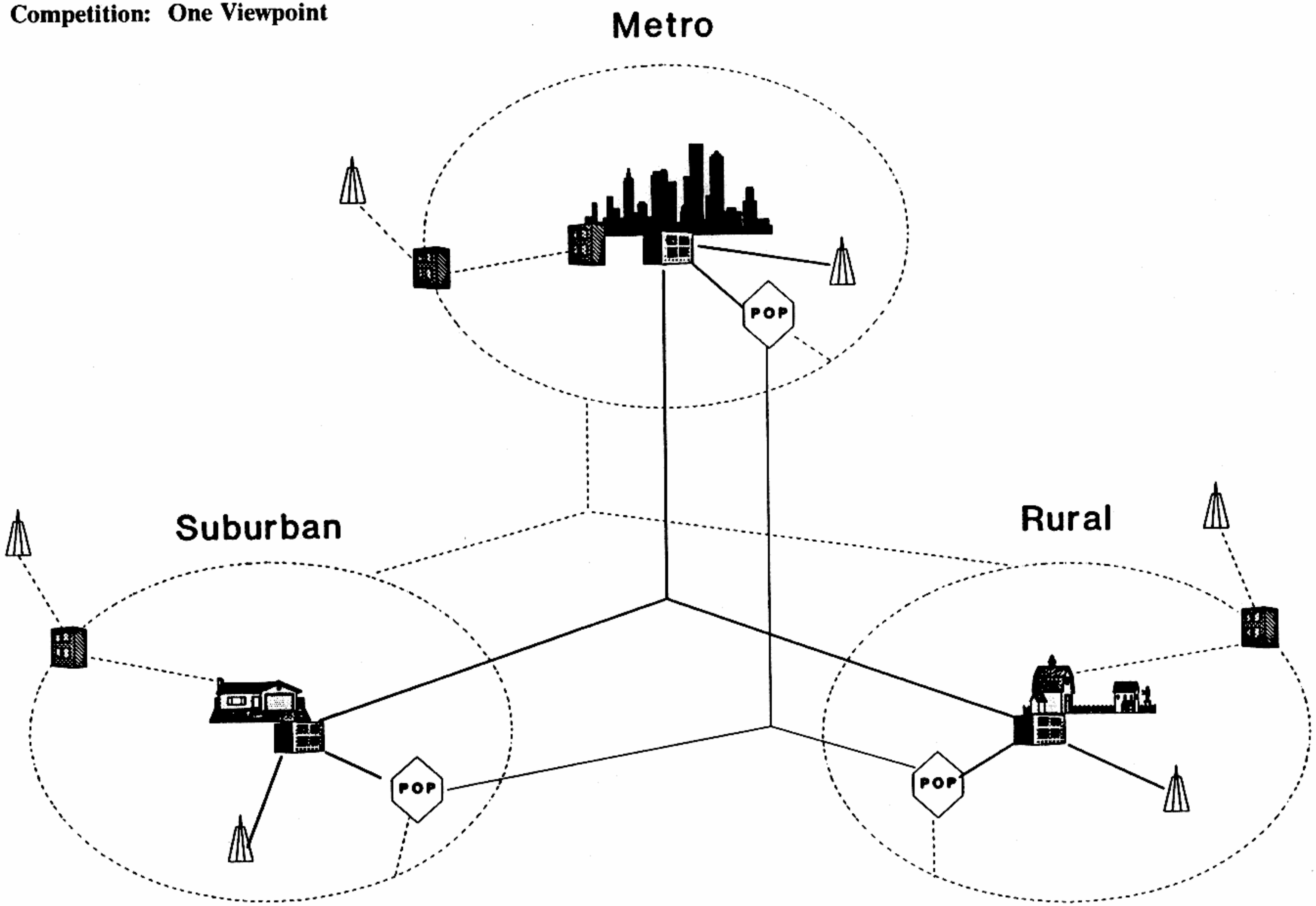
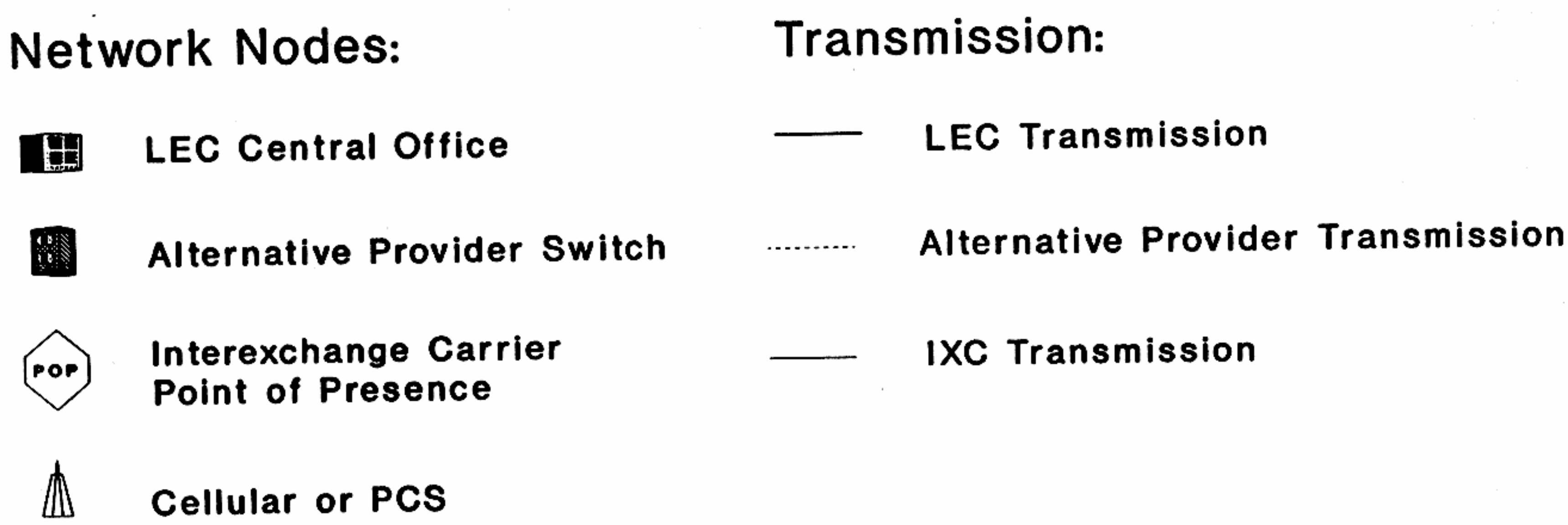


Figure 7
Legend



Figures 8 and **9** show a more near-term scenario for competition and expanded interconnection. **Figure 8** shows interconnection for special access. This is a reality for intrastate services in New York and is expected to occur nation wide for interstate services. **Figure 9** indicates how the special access arrangement can be easily converted to an interconnection arrangement for switched services. In these two figures the collocation arrangements are the same, but in **Figure 9** the collocated circuit equipment now has connections to the trunk side of the end office switch.

Figures 10 through **12** illustrate network configurations that are assumed in the models in **Section III**. However, these figures are just a subset of the facility arrangements that could exist for competition and interconnection. The models could apply to any number of arrangements that use AP facilities instead of LEC facilities.

Figure 10 indicates how an end user could use a high-capacity circuit (in this case, a DS1)[16] to connect to collocated circuit equipment. The AP circuit equipment sends some of the circuits to the line side of the LEC end office switch and sends other circuits to an IXC POP. The AP circuit equipment could do this dynamically, so that an end user could allocate circuits to local exchange service, interexchange service, or other uses as needed.

Figure 11 shows a second configuration. In this situation the AP has local loops, and also has an end office switch that connects to collocated circuit equipment and to an IXC POP. AP end users could originate local calls and long distance calls. LEC end users could be reached through the interconnection arrangement (the cross-connect). AP end users could also receive calls through the AP switch, but the calls would have to be routed through the LEC switch if the AP does not have telephone numbers to assign.

[16] Digital Signal 1 (DS1) lines are 1.544 Megabit per second digital circuits.

Figure 8
Special Access Interconnection (Collocation)

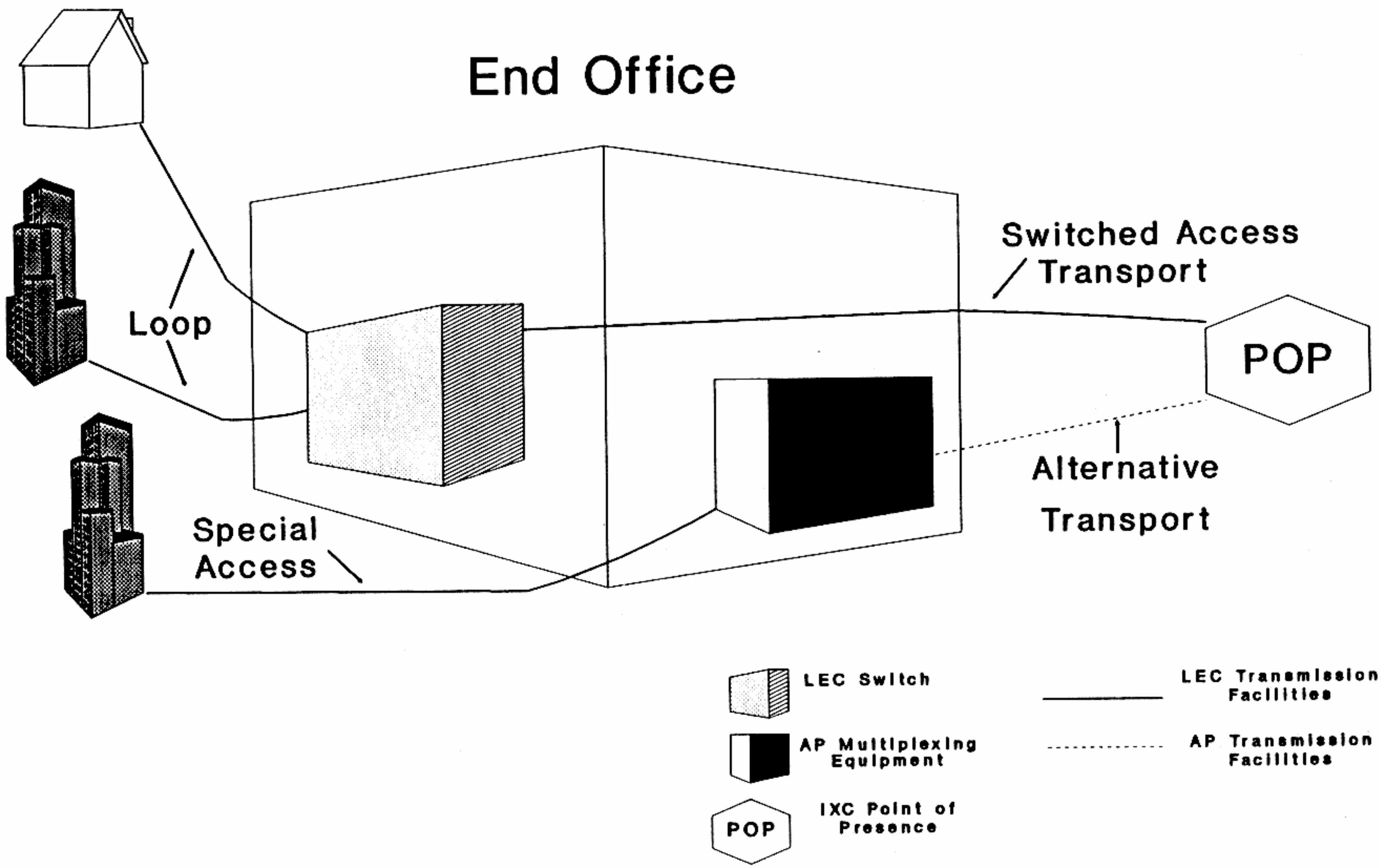


Figure 9
Switched Access Interconnection

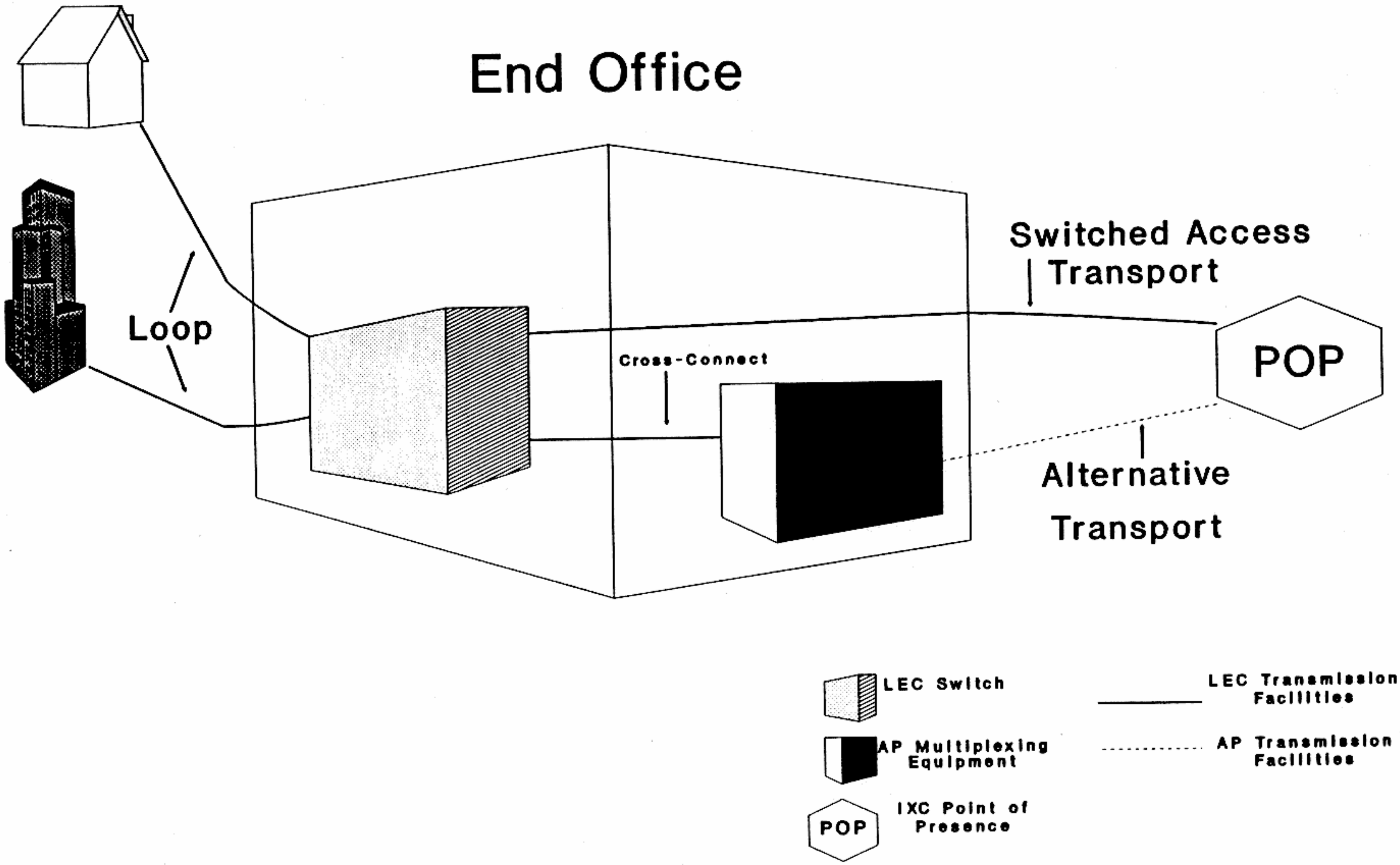


Figure 10
Local Competition: Configuration 1

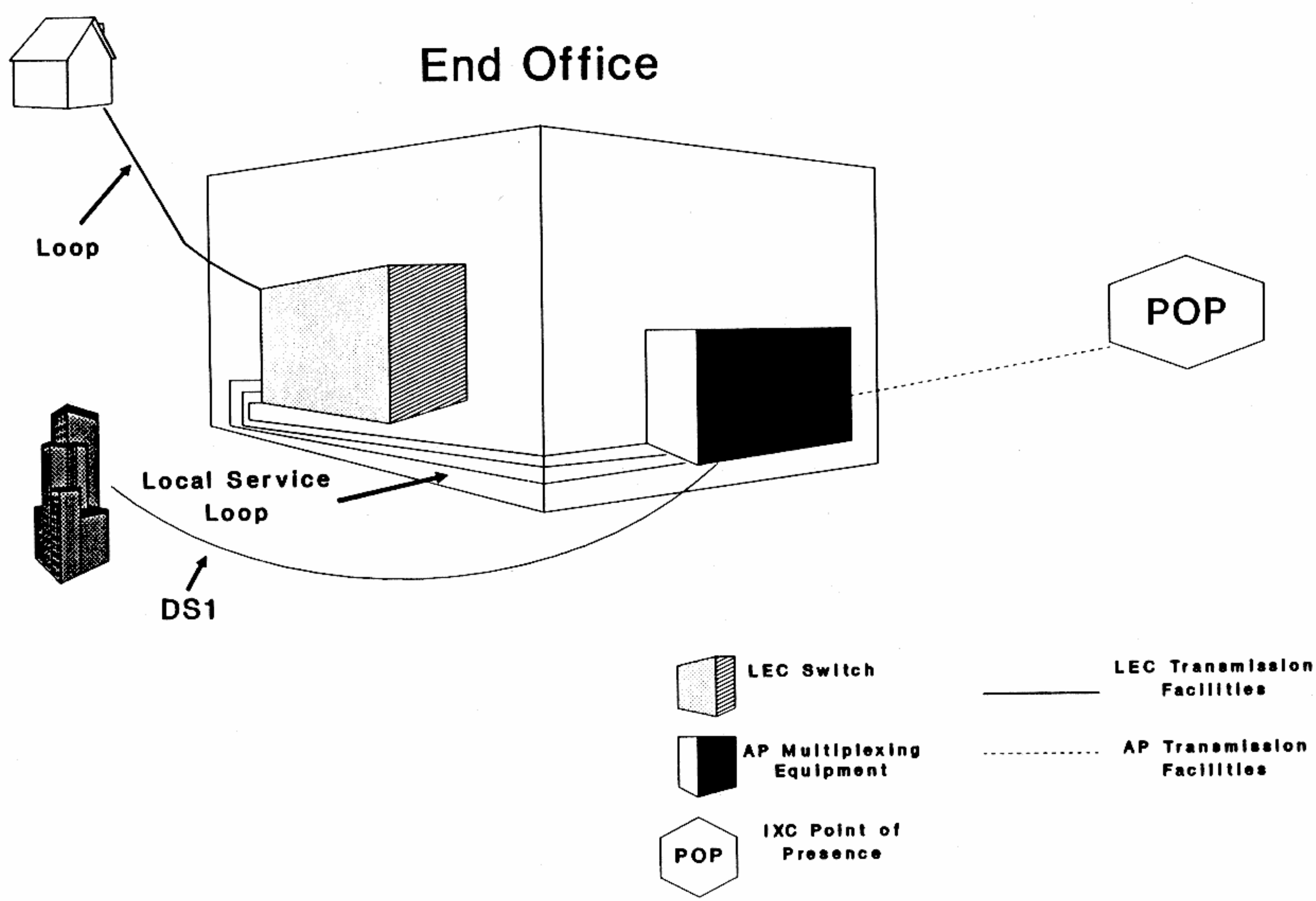


Figure 11
Local Competition: Configuration 2

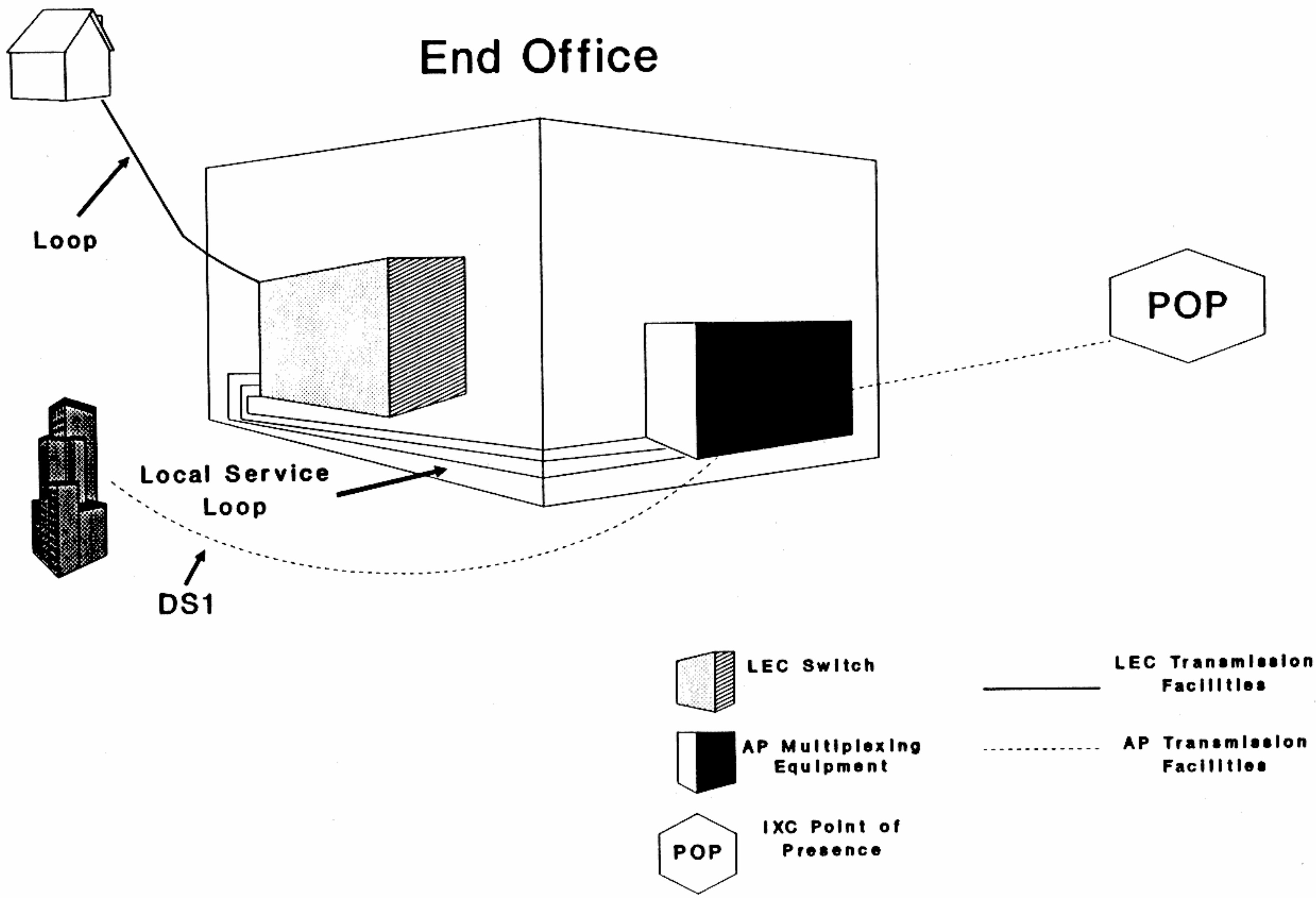


Figure 12
Local Competition: Configuration 3

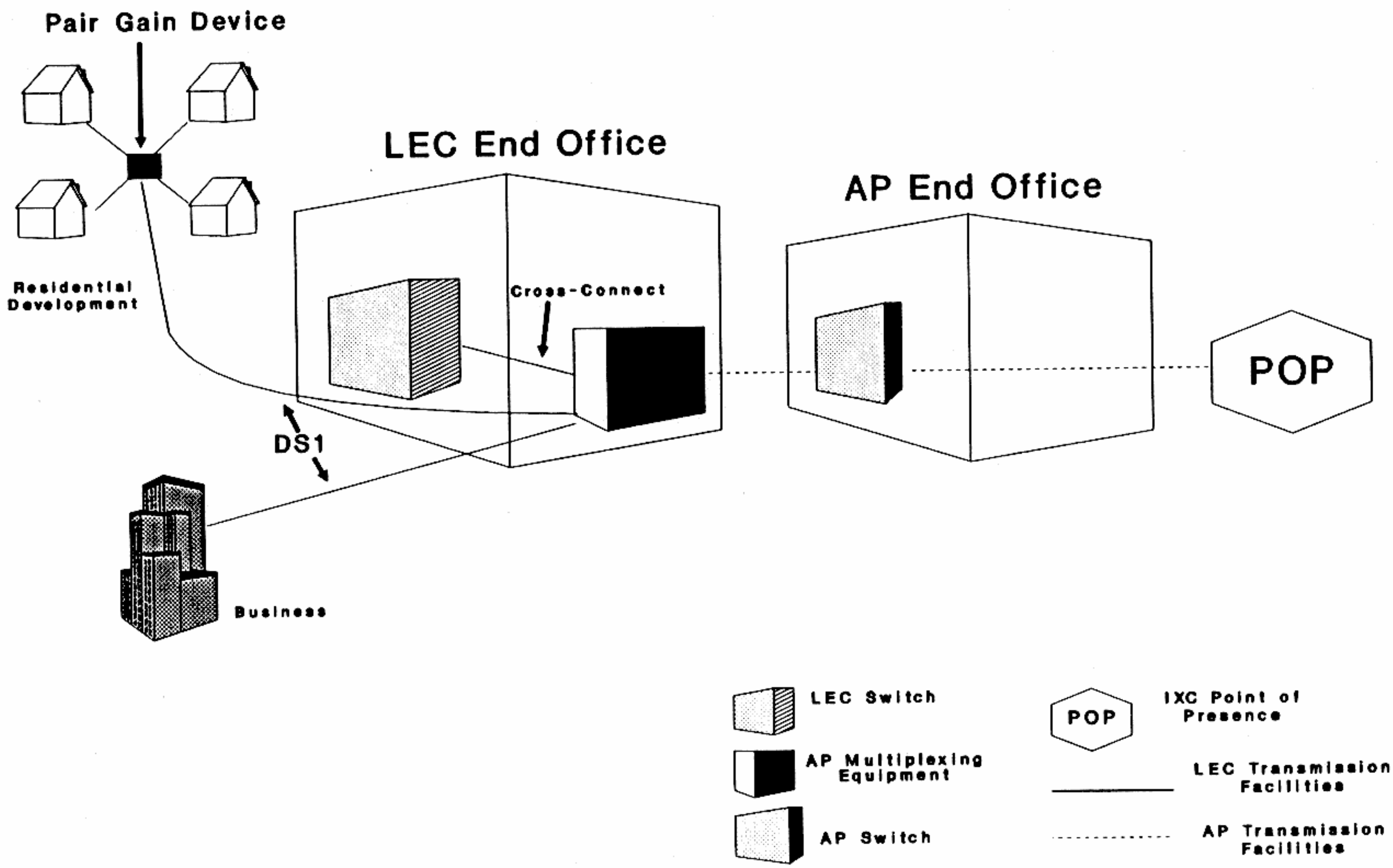


Figure 12 indicates a third configuration. In this case the AP does not have loop facilities. Instead, it uses LEC DS1 lines to connect both large users and residential area pair gain equipment to collocated AP circuit equipment at the LEC end office. The AP circuit equipment connects the end users and the LEC end office switch to the AP end office switch. The AP is also connected to an IXC POP. These three configurations help provide a picture of why some patterns modeled in **Section III** may occur.

Emerging Arrangements — Business

Figure 13 lists potential business arrangements that may exist between an AP and a LEC in the future. The arrangements that will actually exist have not yet been determined. For example, an AP could be classified as an interconnecting LEC or as an access customer (like an IXC). The business arrangements between the AP and the LEC affect prices paid to each other, billing practices, and traffic measurement. How traffic is measured affects billing, separations, and rate making.

Scope of the Issues

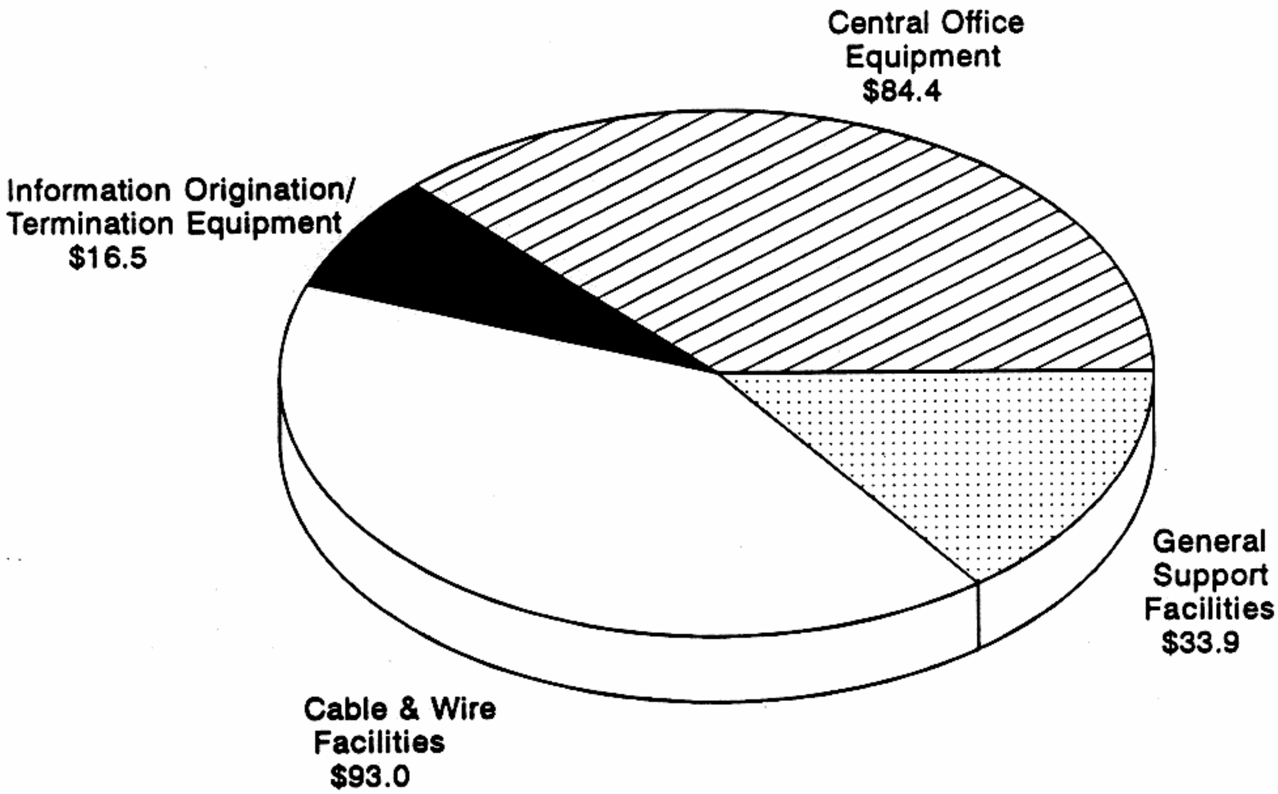
Figures 14, **15**, and **16** illustrate the relative magnitude of several issues arising from the differences between traditional regulatory methods and the introduction of competition and expanded interconnection. **Figure 14** shows relative sizes of interstate investment and the relative sizes of revenues for various interstate access elements. The competition and expanded interconnection issues cover the majority of interstate investment and revenues.

Figure 15 shows current recovery elements (services or rate categories) for three groups of costs: local loop, end office switch, and interoffice network. Each of these network facilities has numerous recovery elements, and many recovery

Figure 13
Possible Business Arrangements Between APs and LECs

View Point	Type of Customer	Payment Arrangements	Jurisdictional Measurement
LEC views AP as:	Interconnecting LEC	None	AP reports to LEC
	Access Customer	Access Tariff	Measured or AP reports to LEC
	End User	Exchange Tariff	Local
	Contract	Contract	Based on jurisdiction of contract
AP views LEC as:	Interconnecting LEC	None	NA
	Tariffed customer	Tariff	NA
	Contract	Contract	NA

Figure 14
Telephone Plant Investment:
1989 Tier I Local Exchange Carriers



Total Telephone Plant Investment
$227.8 billion

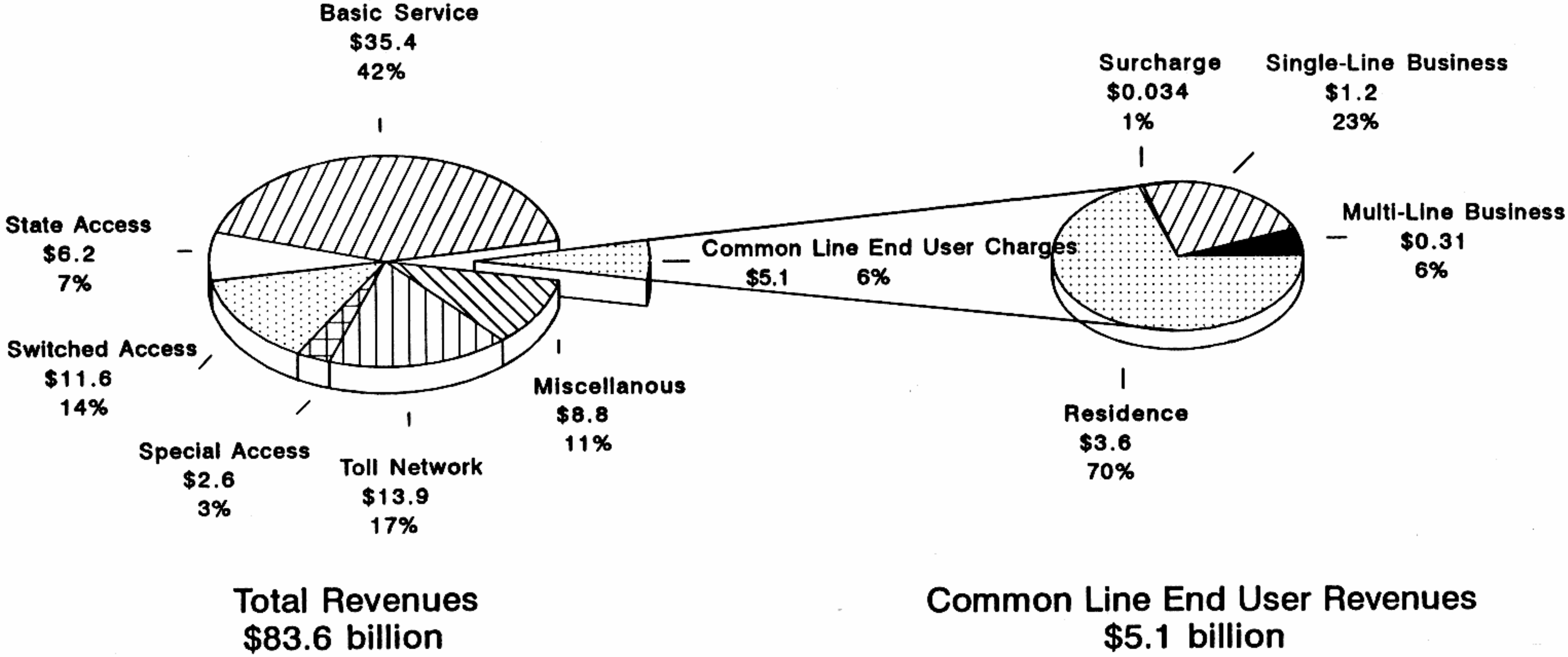
Source: Armis Report 43-04, 1989 Tier 1 Local Exchange Carriers. Compiled from Industry Totals.

Figure 15
Cost Elements and Current Cost Recovery Elements

	Cost Elements		
	Loop	End Office Switching	Interoffice
Cost Recovery Elements	basic service	basic service	basic service
	toll	toll	toll
	special access		special access
	switched* access	switched* access	switched* access
	subscriber line charge	operator services	operator services

* Switched access includes carrier common line, the special access surcharge, and the Universal Service Fund for loop costs; local switching and dial equipment minute weighting for end office switching; and local transport for interoffice.

Figure 16
Revenues by Service Category:
1989 Tier I Local Exchange Carriers



SOURCE: Armis Report 43-03, 1989 Tier 1 Local Exchange Carriers. Compiled from Industry Totals. All Subscriber line Charge revenues developed by multiplying the maximum rate by the appropriate number of access lines.

elements are used for more than one cost element. In addition various services make different levels of contribution to the recovery of joint and common costs. It is difficult to unbundle services because of these interrelationships and the different levels of contribution.

Figure 16 illustrates the relative amount of revenues collected from current cost recovery elements. The larger portions of the pie chart indicate areas where unbundling will have greater stakeholder impacts. In addition, revenues per customer also indicate stakeholder interest and ability to influence the process. Varying amounts of stakeholder interest and ability to participate in the process complicates rate restructuring.

These three figures indicate only a portion of the scope of the issues. To fully evaluate the impact of unbundling requires data on APs.

III. Models

Caveats and Assumptions

This section presents the results of the models. The models cover three areas of competition — interoffice facilities, end office switch, and local loop — and cover three types of traditional methods — cost recovery and allocation methods, rate averaging, and support mechanisms.

The models are simplifications of reality. They indicate areas where new and old regulatory and industry methods may collide. In doing so, they show trends and orders of magnitude. The specific results for any particular company or area may vary from the results shown.

Assumptions vary between models, but three assumptions are common to all models:

- It is assumed that interconnection is accompanied by physical collocation of circuit equipment.
- Extended area service traffic is not considered.
- Total embedded cost does not vary with changes in demand.[17]

[17] Estimates were made of embedded cost changes due to changes in demand. The methods used are shown in **Appendix B**. They were not included in the models for two reasons. First, the potential effects on the models appeared to be small and would not change the patterns. For example, the largest effect found was for loops, and a 33% reduction in loop demand decreased total loop costs less than 2%. Second, including the cost changes would have made the models more complex and thus more difficult to review. This assumption makes the models flash cut. Phased-in effects would be less in some instances.

Effects of Competition for Interoffice Facilities

A. Cost Recovery and Allocation: Effects of Changes in Demand

The cost basis for LEC prices is generally embedded cost — the accounting-based investment and expenses. Embedded cost is affected only slightly with changes in demand, so per unit costs can vary greatly depending on the number of units sold. If prices are allowed to vary with the unit costs, customers benefit if prices decline, or captive customers become worse off if prices increase. Competition is also affected. If prices are not allowed to vary with unit costs, LEC profits are affected. In addition to these effects, cost allocations between services and jurisdictions are driven largely by demand factors. As a result, changes in usage patterns cause shifts in allocated costs, independent of why the costs are incurred, or whom the costs benefit.

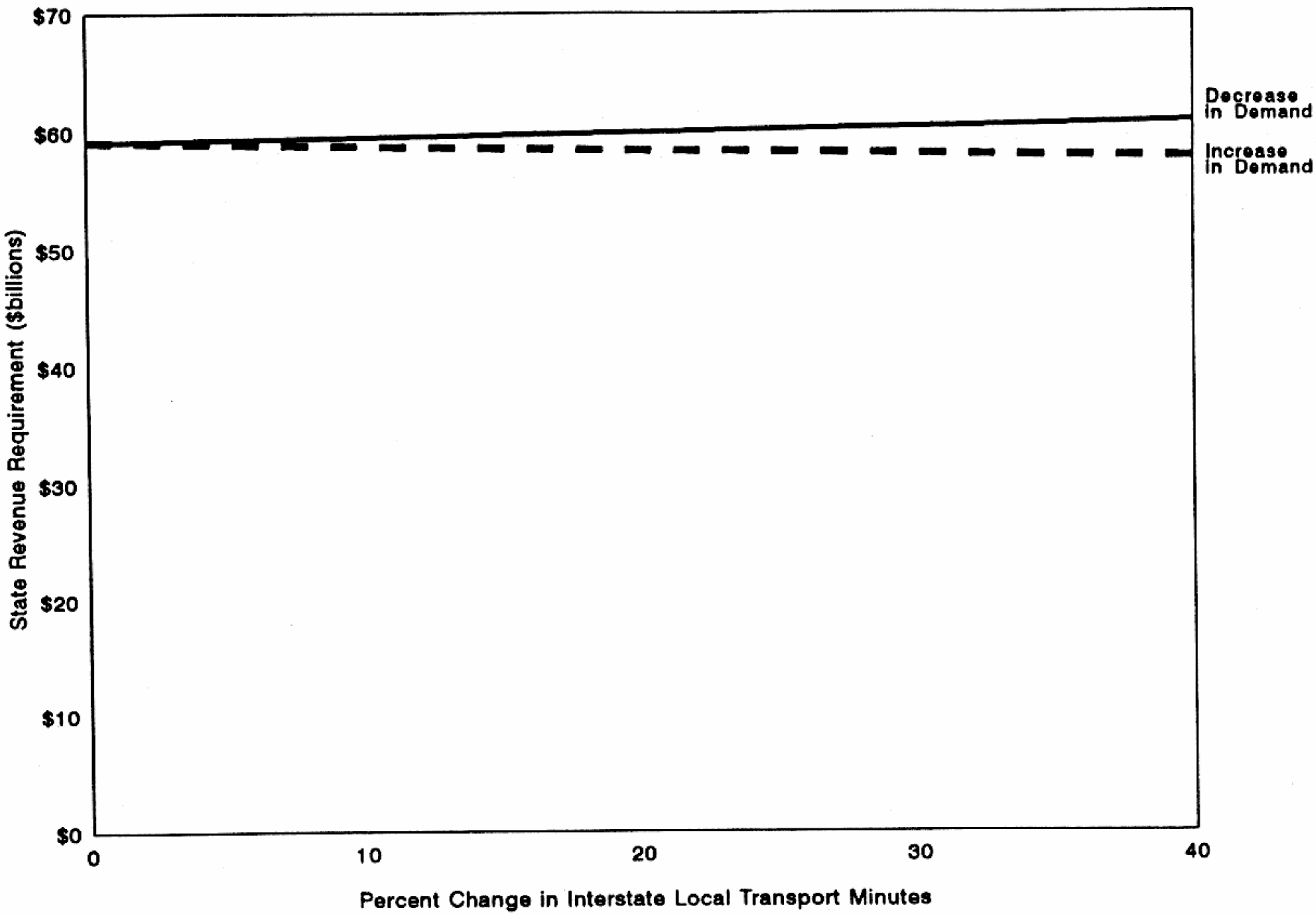
Competition for local transport affects the volume of demand for LEC services. One effect could be that the demand for LEC local transport would decrease from today's demand. Also, it could be that competition would only capture growth in market demand, so that the LEC would not see an absolute decrease in traffic. A third alternative could be that the competition would actually stimulate market demand, and that the APs would capture only a portion of the growth, so that the demand for LEC services would actually be higher than it would be otherwise.[18]

Figures 17 and **18** show possible effects of changes in demand on jurisdictional cost allocations and costs for interstate rate elements.[19] In both figures, it is

[18] Another variation might be where competition for local transport discourages total bypass of the LEC network. While LEC local transport traffic might decrease, LEC switch and loop traffic might actually increase; although probably at the cost of a decrease in traffic over special access.

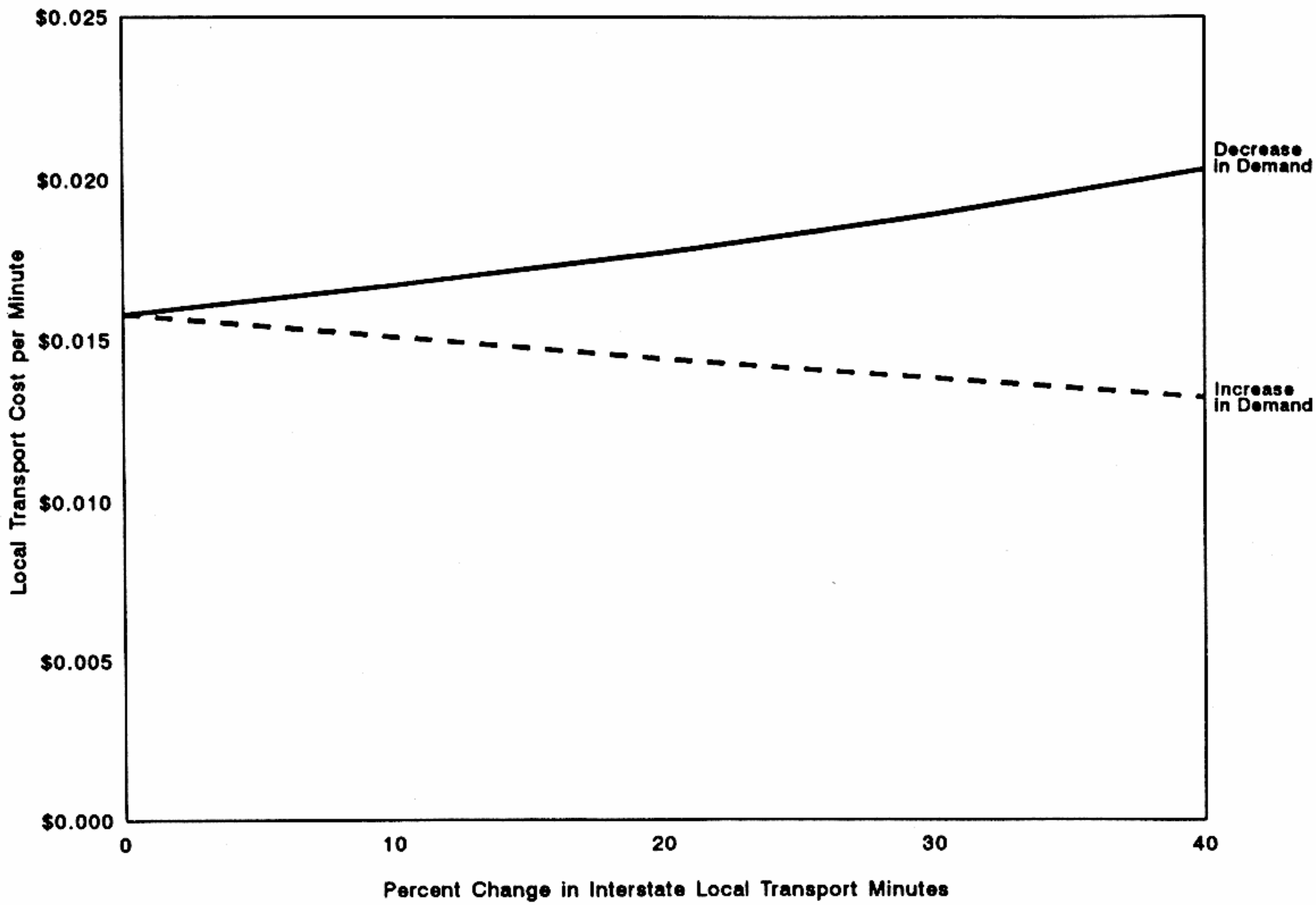
[19] One alternative to the separations and interstate rate making effects would be to deregulate local transport and allocate the costs in Part 64. Part 64 cost allocation manuals are developed on a company-by-company basis; therefore, it can be assumed that the results would not match the effects of Part 36 and Part 69. It is not possible to reasonably predict the net effect of the companies' proposals for their Part 64 cost allocation manuals, nor of what the FCC would approve.

Figure 17
Change in State Revenue Requirement Due to Change in Interstate Local Transport Demand



Source: Armis Report 43-04, 1989 Tier 1 Local Exchange Carriers. Compiled from industry totals and processed using the Data Analysis Tool (DAT).

Figure 18
Change in Local Transport Unit Costs Due to Change in Interstate Local Transport Demand



Source: Armis Report 43-04, 1989 Tier 1 Local Exchange Carriers. Compiled from industry totals and processed using the Data Analysis Tool (DAT).

assumed that competition is allowed for interstate only, so only interstate minutes are affected.

If competition were allowed only for interstate local transport and the LEC interstate traffic decreased, state revenue requirements would increase. **Figure 17** illustrates the potential effects. Most of the increase would be in interoffice facilities. States using fully distributed cost for rate making would likely see an increase in access and LEC toll costs.

At the same time intrastate revenue requirements would be increasing, LEC unit costs for interstate local transport would be increasing. **Figure 18** shows the potential effects. If interstate prices did not increase a comparable amount, LECs would likely see a decrease in profits from interstate local transport. If LEC interstate prices did increase, competition could cause further decreases in demand for LEC local transport.

B. Averaging

There are two incentives to deaverage rates. First, some customers are more price sensitive than others. Companies are more likely to want to lower prices for customers that are price sensitive. Additionally, competition makes customers more price sensitive because customers have more alternatives. Second, costs to provide services vary with markets and customers. Companies have an incentive to have lower prices where costs are lower. The following figures illustrate some of the incentives for rate deaveraging in the local transport market.

Numerous factors can affect entry into a market. One view is that there are nine prerequisites for effective local exchange competition. **Figure 19** lists those.

Figure 19
One View of Prerequisites for Effective Local Exchange Competition[20]

1. Cost-based central office interconnection arrangements.
2. Unbundled local loops at cost-based rates.
3. Unbundled switching and facility elements at cost-based rates.
4. Equal access to LEC tandem switches and interoffice networks.
5. Equal access to LEC Signaling System 7 databases.
6. Telephone number portability.
7. Unbundled, cost-based rates for competitors' calls completed by LEC.
8. Unbundled, cost-based rates for LEC calls completed by competitor.
9. Cooperative practices and procedures.

[20] Teleport Communications Group, Comments to FCC in CC Docket No. 87-266, *Telephone Company-Cable Television Cross-Ownership Rules*, February 10, 1992, p. 3.

Another view is that competition will occur where market prices exceed costs and offer an attractive profit. **Figure 20** illustrates where this might occur in local transport markets. The horizontal line represents the LECs' average cost per minute for local transport (based on Part 69). The downsloping curve illustrates the cost per minute per month for fiber optic channels.[21] The curve assumes five DS3 channels on a single fiber cable, so it illustrates the cost for a single fiber route.

The area to the right of where the DS3 curve intersects the average LEC cost represents the local transport markets where competition is most likely, assuming LEC rates would remain averaged and are comparable to average cost. LECs would have an incentive to decrease rates in these markets. If AP costs were double those assumed, the point of intersection would move to the right by a factor of two. Data are not readily available on numbers of end offices that would be subject to competition, but the average Bell Operating Company (BOC) end office has 3,973,000 minutes of interexchange traffic per month.[22]

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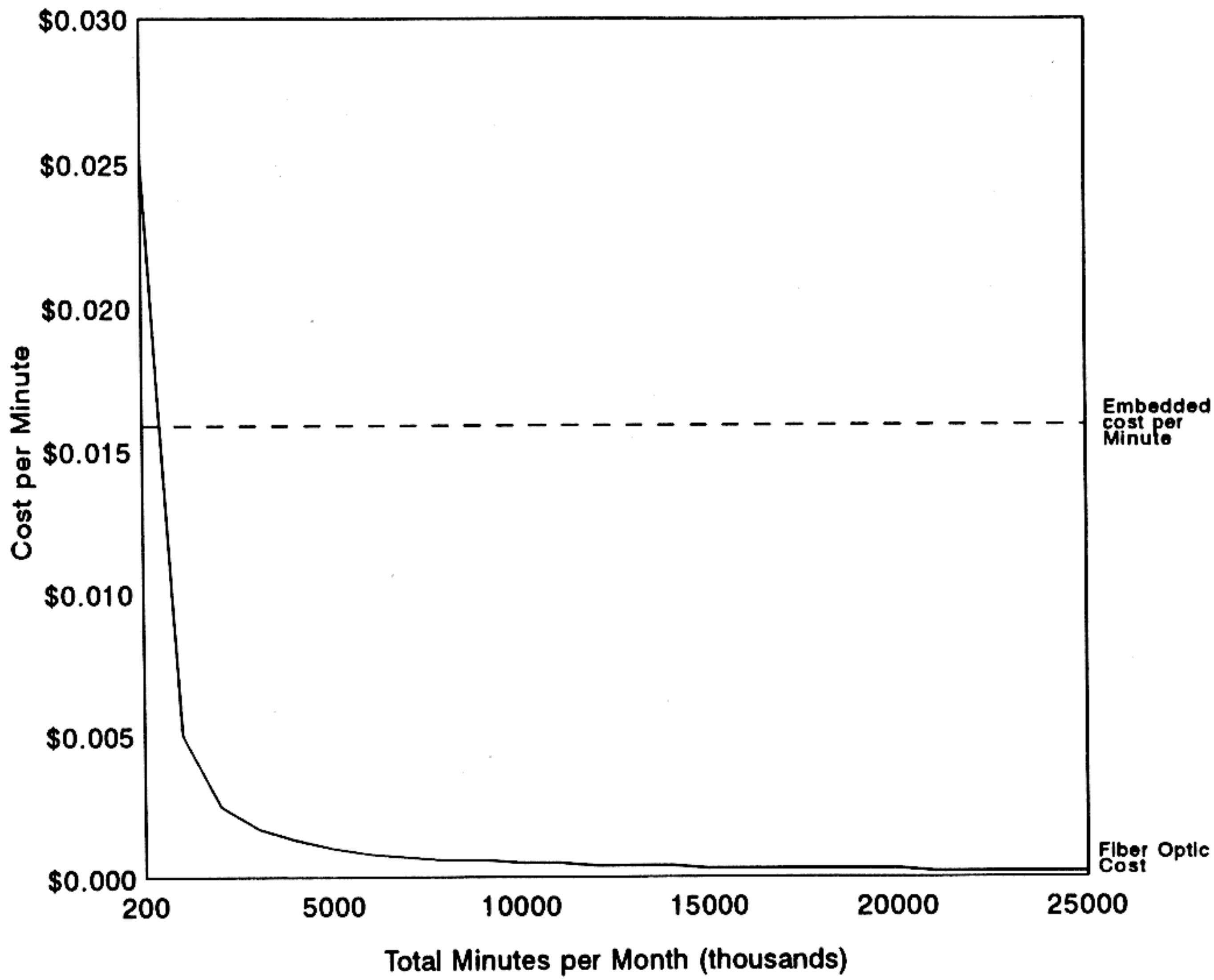
[21] Development of costs for fiber optic facilities:

Monthly cost for four miles of fiber optic cable was assumed to be $1491. Monthly cost for electronics for five Digital Signal 3 (DS3) channels (two ends) was assumed to be $3532. Both of these cost estimates were provided by Sprint Local Telecom Division. Monthly costs were divided by minutes of use (monthly per route) to construct the chart. DS3 lines are 45 Megabit per second digital channels.

[22] Development of average minutes of use per BOC end office:

Annual interexchange Dial Equipment Minutes (447,613,777,000) (CC Docket No. 87-339, *Monitoring Report*, Tables 4.9-4.11.) were divided by number of end offices (9,389) (BOC filings in response to CC Docket No. 89-624, *Represcribing the Authorized Rate of Return for Interstate Services of Local Exchange Carriers*, FCC Order No. 90-5, January 5, 1990.).

Figure 20
Comparison of Local Transport Cost: Embedded vs. Fiber Optic Equipment



Implementing the FCC's proposal for a RIC changes the results considerably.[23] Current industry estimates place the RIC at approximately 80% of the allocated cost (or current revenues).[24] **Figure 21** illustrates how that affects incentives for entry. The DS3 curve is unchanged, but LEC's local transport cost is decreased by 80%. The minimum market size likely to see competition is increased by approximately 400%. Also, potential AP profit margins (illustrated by the difference between the LEC cost and the fiber cost) are reduced. These decrease the scope of possible competition.

These figures also illustrate the pressures for geographic rate deaveraging. LECs would have more of an incentive to decrease local transport rates in areas where competition is likely via DS3s than in areas where traffic is less concentrated. The cost difference between LEC costs and fiber optic costs increases with higher concentration of traffic, so the incentive for LECs to decrease rates does, also.

Another way to look at potential rate deaveraging is to look at rural versus urban costs. Potential rate differentials between rural and urban areas are in the range of 100% to 200%.[25]

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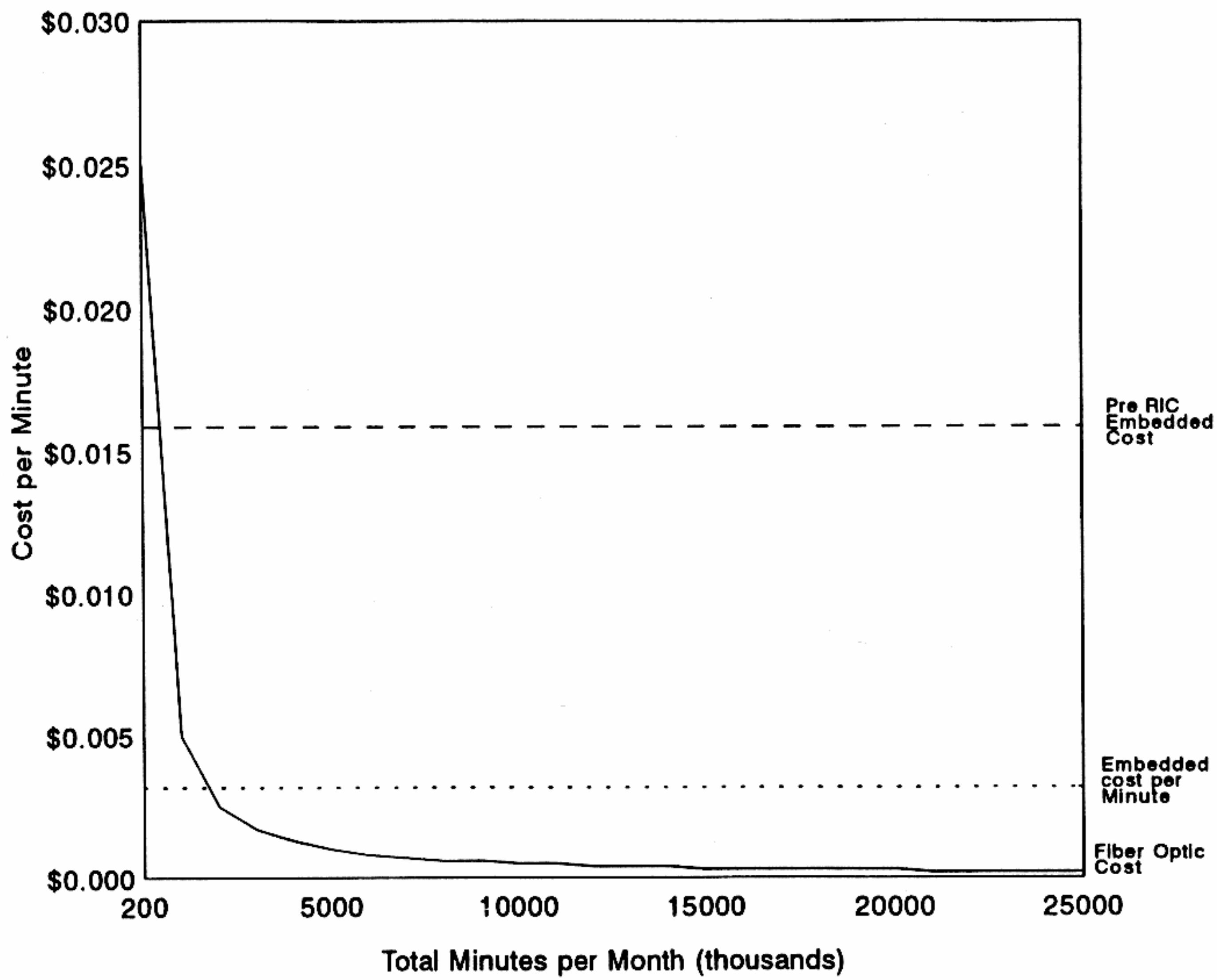
[23] In its proposal to de-average local transport rates, the FCC defined a new network element called the RIC. The RIC would be paid by all interstate customers of LEC local transport, and would be collected based on use of the end office switch. The charge would be considered residual because it would be the difference between the costs allocated to local transport in Part 69 (or current LEC local transport revenues), and rates charged for the transport itself. Those rates would presumably be based on an equivalency formula, or a measure of incremental cost.

[24] Southwestern Bell, Ex Parte filing in CC Docket Nos. 78-72 and 91-213, *Transport Rate Structure*, June 12, 1992.

[25] Weinhaus and Jamison, *Examples of Modeling*, Figure 18, p. 43.

Figure 21
Comparison of Local Transport Cost: Embedded and RIC vs. Fiber Optic Equipment



Rate deaveraging need not be based simply on geography. It could be based on type of customer, so that large customers and/or customers on high density routes receive lower rates.

One view is that rate deaveraging on a customer basis is not legitimate because economies of scale are caused by markets, not individual customers. Another view is that customer size influences both the competition for the customer and the customer's opportunities to build its own facilities. This view would say that these pressures affect the customer's willingness to pay some prices, and that any price above marginal cost would make a contribution to fixed costs, thus making the remaining customers (or service provider) better off.

C. Supports

The FCC presumed the RIC would represent the difference between the allocated costs and the actual costs of local transport.[26] If this is correct, one view could be that the allocated costs rightfully belong to other services, so that local transport is providing a subsidy these services. Another view could be that the discrepancy between allocated and actual costs results from accounting,[27] inefficiency in company operations, or both. A third perspective could be that the RIC results from the charges for the transport itself representing the costs of high density routes. In this case the RIC would provide support for higher cost areas and/or small IXCs. In essence, then, the RIC is a support mechanism for other services, inefficiency, high cost areas, small IXCs, or some combination of these.

[26] CC Docket Nos. 78-72 and 91-213, *Transport Rate Structure*, par. 17, n. 49.

[27] Examples would include inadequate depreciation and over aggregation of costs in accounts. An example of over aggregation would be having high cost facilities and low cost facilities recorded in the same account. When the account's costs are distributed for rate making, the costs of services using low cost facilities would likely be overstated because the actual costs of the facilities cannot be identified.

It is not possible to directly assess the appropriateness of the RIC amounts that APs may pay. **Figure 22** shows the composition of LEC revenue requirement for local transport. From an accounting perspective, approximately 10% (Corporate Operations) could be clearly identified as corporate overhead, but overhead costs could also be found in the detail of other portions of the revenue requirement. The majority of the revenue requirement comes from expenses for operating telephone plant. The expenses and investment that make up the revenue requirement are almost entirely allocated costs. Even investment costs such as cable and circuit facilities are often booked in aggregate, and then later allocated to the separations categories that are eventually allocated to local transport. As a result, it is not possible to determine how much of the revenue requirement represents direct costs.

Likewise, it is not possible to determine which portions of the revenue requirement would make up the RIC. The RIC is intended to be a residual amount. The dollars that would make up the rates actually charged for use of local transport will likely come from sources other than the LECs' embedded costs.[28]

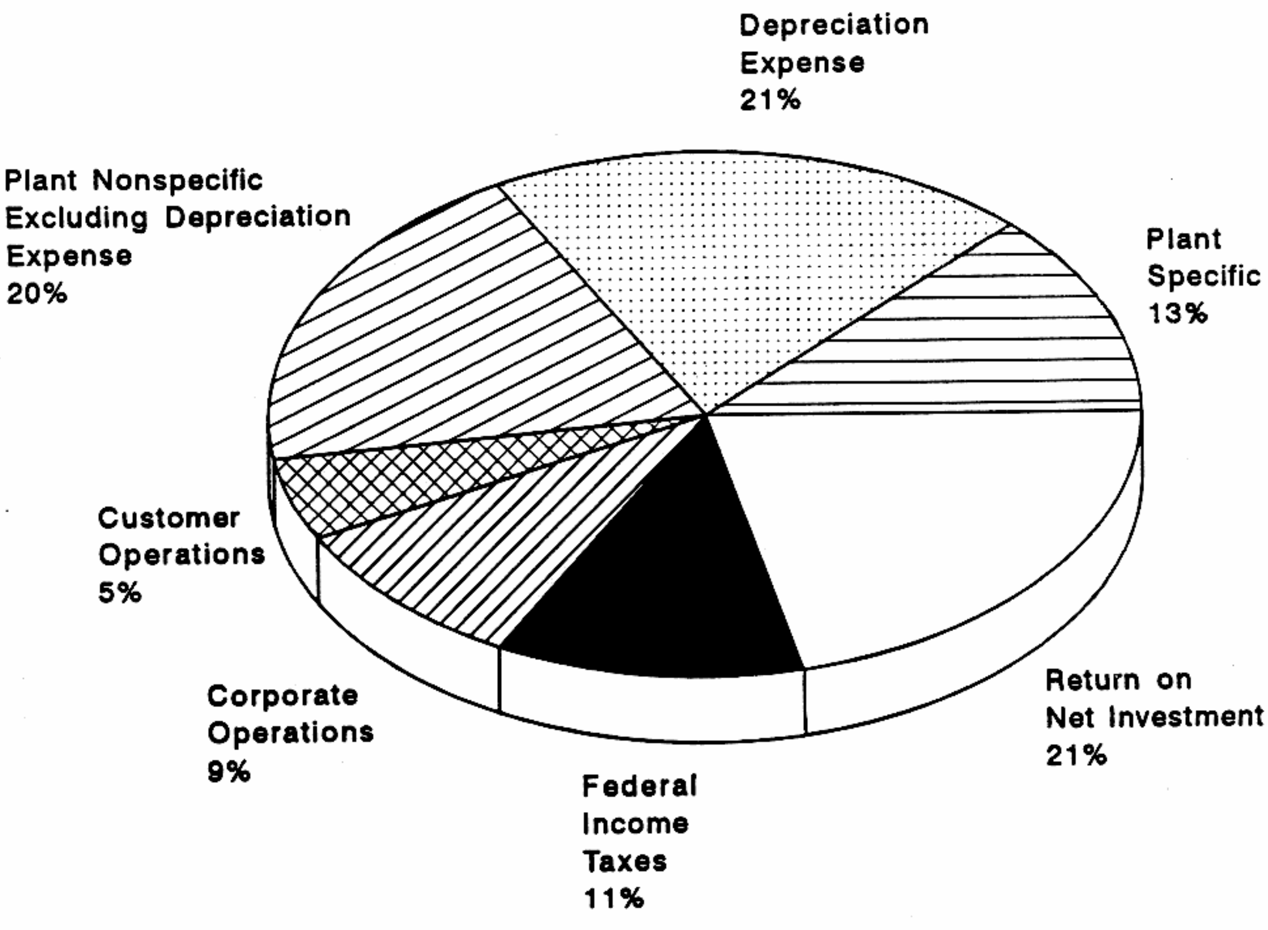
Effects of Competition for End Office Switch

Competition for end office switching occurs today with cellular, but the effects are probably minimal. More pronounced effects are more likely if APs such as competitive access providers[29] and cable television, install switching functionality, interconnect for Signaling System 7, and obtain telephone numbers. The interstate local transport RIC that may be implemented would increase the

[28] The analysis would be even less precise for those LECs whose RICs will be based on local transport revenues rather than revenue requirement.

[29] Competitive access providers (CAPs) are companies that operate fiber optic networks, primarily in metropolitan areas. Metropolitan Fiber Systems and Teleport are examples of CAPs.

Figure 22
Composition of Local Transport Revenue Requirement:
1989 Tier I Local Exchange Carriers



Local Transport Revenue Requirement
$4.4 billion

Source: Armis Report 43-04, 1989 Tier 1 Local Exchange Carrier. Compiled from Industry Totals.

probability of end office competition, because the RIC would increase the LECs' prices for interstate end office switching.

A. Cost Recovery and Allocation

1. Effects on Investment

Competition in end office switching would provide the existing LECs incentives to modernize their switches because older technology switches may not be able to compete, especially for larger customers. In 1991 36% of BOC end offices were not digital. Local loops connected to those end offices comprised 53% of BOC local loops.[30]

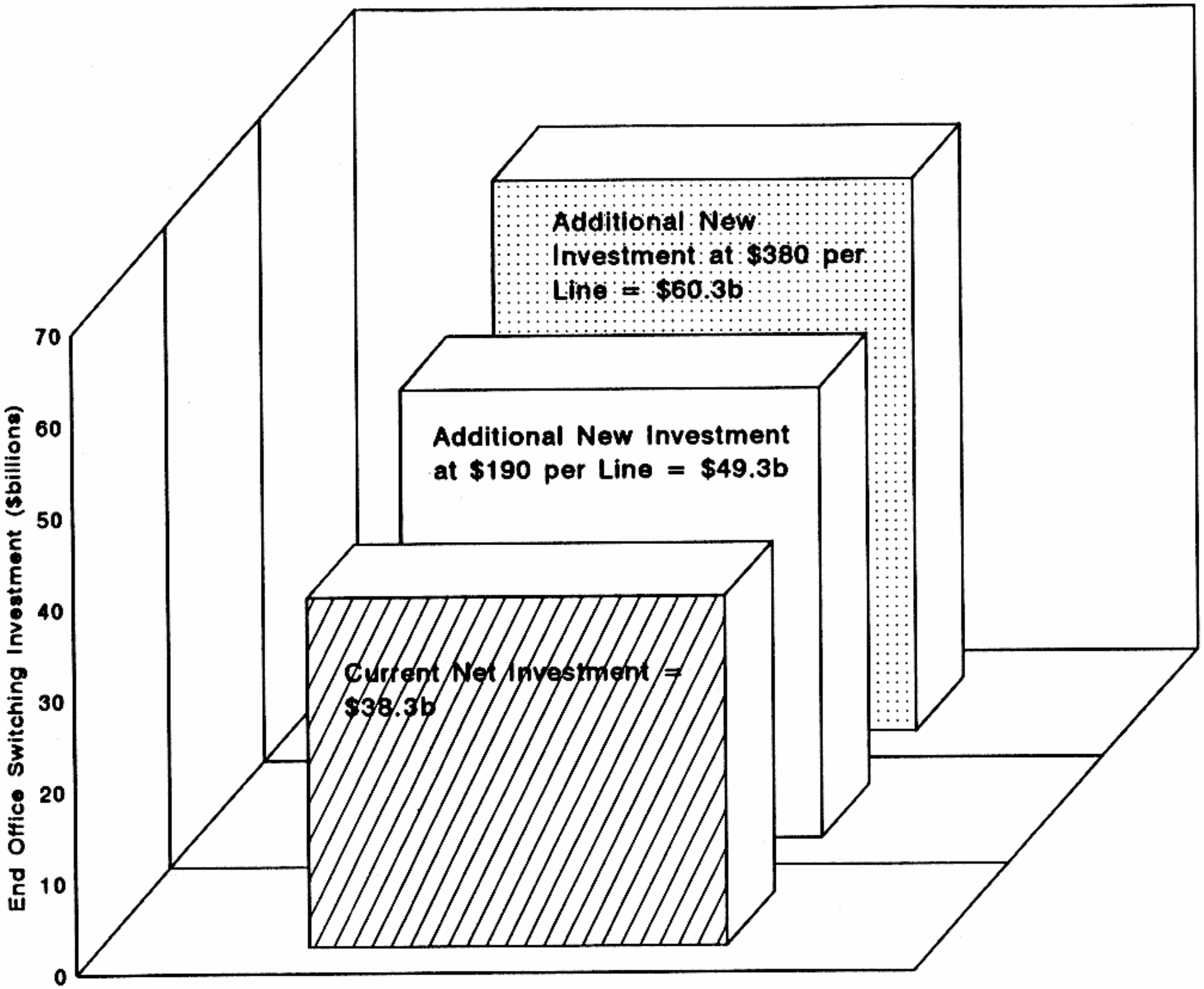
Upgrading LEC facilities raises the question of who would pay the cost of the additional investment. **Figure 23** illustrates how the additional investment might compare with current investment levels. Additional investment increases revenue requirement. In general terms, one dollar of additional investment increased revenue requirement by forty to fifty cents. Also, the longer the amount of time allowed to make an investment, the less abrupt the impact on revenue requirement.

Figure 23 shows for BOCs the current net investment, and what the net investment might be if the older technology switches were immediately replaced with digital switches. Two estimates of the possible new investment are shown. The first estimate assumes that additional investment per line is the same as it was in 1989 — $380. This is comparable to the average embedded investment per line in digital switching for the BOCs in 1989 — $370.[31] This estimate of additional investment assumes that digital switch prices, installation costs, and the sizes of

[30] BOC filings in response to CC Docket No. 89-624, *Represcribing the Authorized Rate of Return*.

[31] Source: ARMIS Report 43-0-2, 1989, BOCs. BOC filings in response to CC Docket No. 89-624, *Represcribing the Authorized Rate of Return*.

Figure 23
Comparison of Current and Future Investment Levels for LEC End Office Switching



Source: Armis Report 43-02, 1989 Tier 1 Local Exchange Carriers. Compiled from Bell Operating Companies Totals. Net Investment equals gross Investment multiplied by 70%.

switches being installed during 1989 are comparable to what will occur in the future. These factors are, of course, not stable. In fact, many large LECs are now purchasing switches in large quantities, and so are paying much lower prices. In addition, there is a learning curve for new technologies, so installation costs may also be less. A more realistic estimate might be the second one, which assumes that the cost per line is 50% of the first estimate.

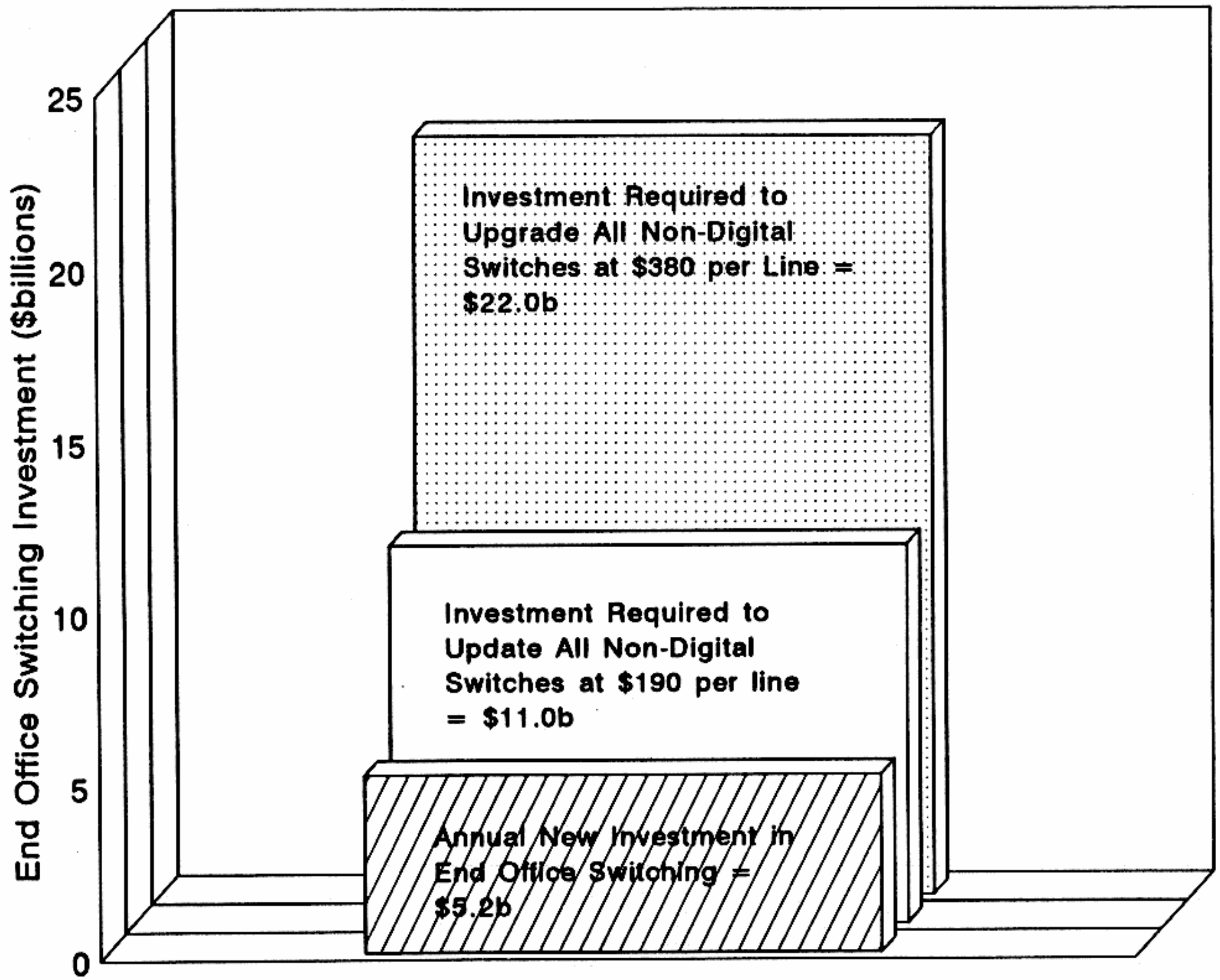
This decrease in the cost of placing digital switches may indicate a cost recovery problem for the LECs, a competitive problem for APs, or both. If the decreased installation cost is general and would apply to APs, the competitive market price of end office switching would likely be lower than the embedded cost of the existing LEC digital switches. This would make it difficult for the LECs to recover the costs of the 64% of their switches that are already digital. If, on the other hand, the decrease in the cost of placing digital switches is a result of economies of scale or purchasing power for large LECs, and would not apply to APs, APs may be at a cost disadvantage compared to the LECs.

Figure 24 compares the estimates of new investment to the BOC current annual new investment in central office equipment. This figure indicates changes in BOC investment practices that would need to occur to upgrade end offices. The importance of this figure depends upon where the older technology switches are located. Most electromechanical switches are located in rural areas, where competition would not be eminent. Most analog electronic switches would be in urban areas, and would most likely be the first to be replaced.

2. Changes in Demand

As with local transport, competition for end office switching could affect the demand for LEC switching. Separations is affected if competition affects the jurisdictional distribution of traffic. Cost per minute (as defined by Part 69) is affected by both the distribution of traffic and the absolute quantity.

Figure 24
Comparison of BOC 1989 New Switching Investment and Potential BOC Investment Required to Upgrade



Source: Armis Report 43-02, 1989 Tier 1 Local Exchange Carriers. Compiled from Bell Operating Companies Totals.

Figure 25 demonstrates the possible effect on the LEC average cost of switching interstate traffic. In general, a 1% decrease in interstate traffic results in a 1% increase in LEC average cost per minute. As with local transport, if prices are allowed to vary with the unit costs, customers benefit if prices decline, or captive customers become worse off if prices increase. Competition is also affected. If prices are not allowed to vary with unit costs, LEC profits are affected.

B. Averaging

Competition and expanded interconnection increase pressures to deaverage rates for end office switching. LECs would have an incentive to decrease rates in areas where competition occurs, and increase rates where competition is less. As with local transport, the incentives for deaveraging are differences in cost between markets, and differences in customer responses to prices.

Figure 26 illustrates the potential rate deaveraging in LEC rates for end office switching. The first four bars show the potential geographic rate deaveraging. Shown are average cost per minute (as defined by Part 69) for four types of study areas: large urban, small urban, large rural, and small rural.

Figure 26 also illustrates potential customer rate deaveraging. The last two bars contrast embedded costs and incremental costs. The embedded cost shown is the average interstate cost per minute for local switching. The incremental cost shown is called the average incremental cost expressed on a minute of use

Figure 25
Comparison of Local Switching Cost per Minute with Change in Interstate Demand

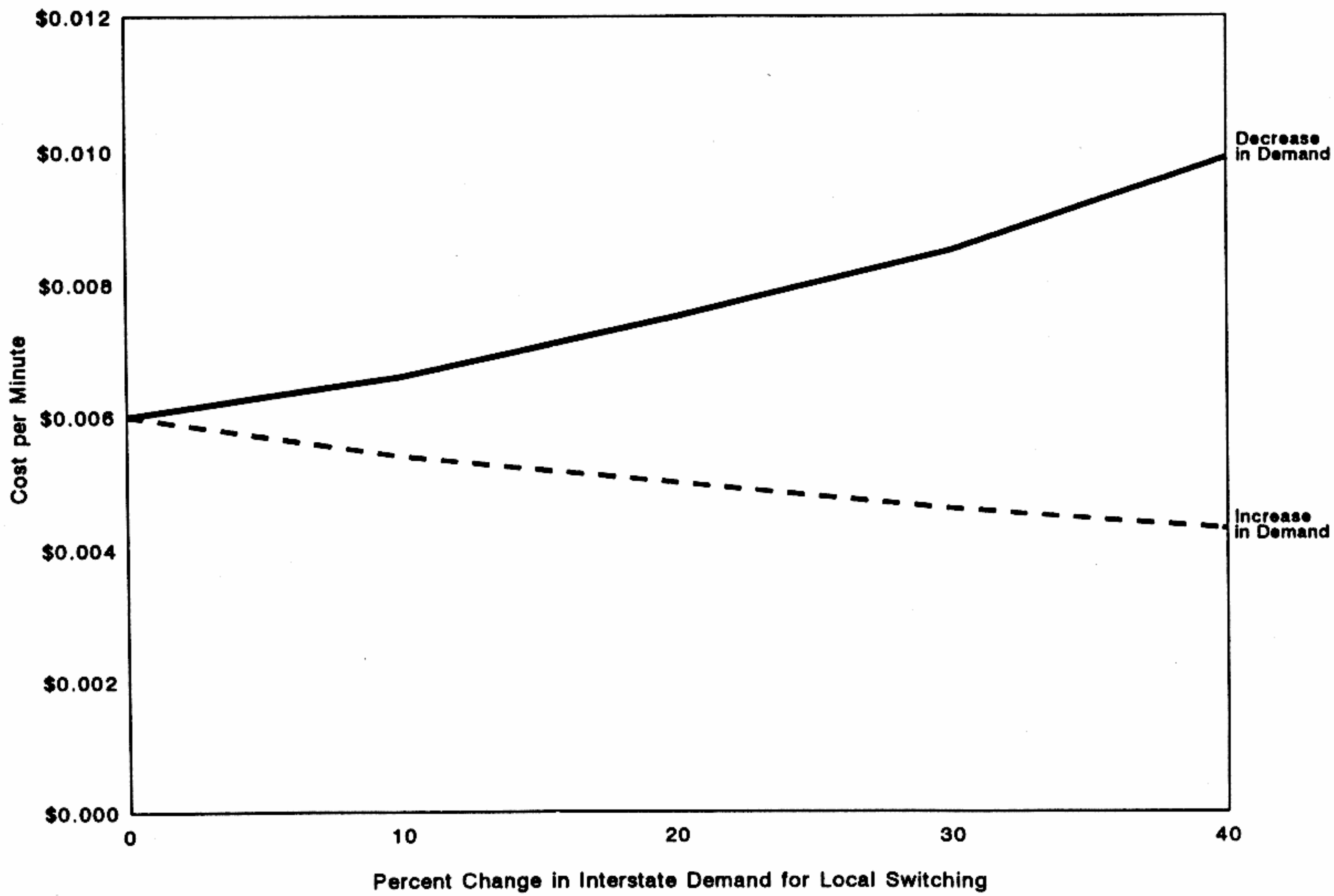
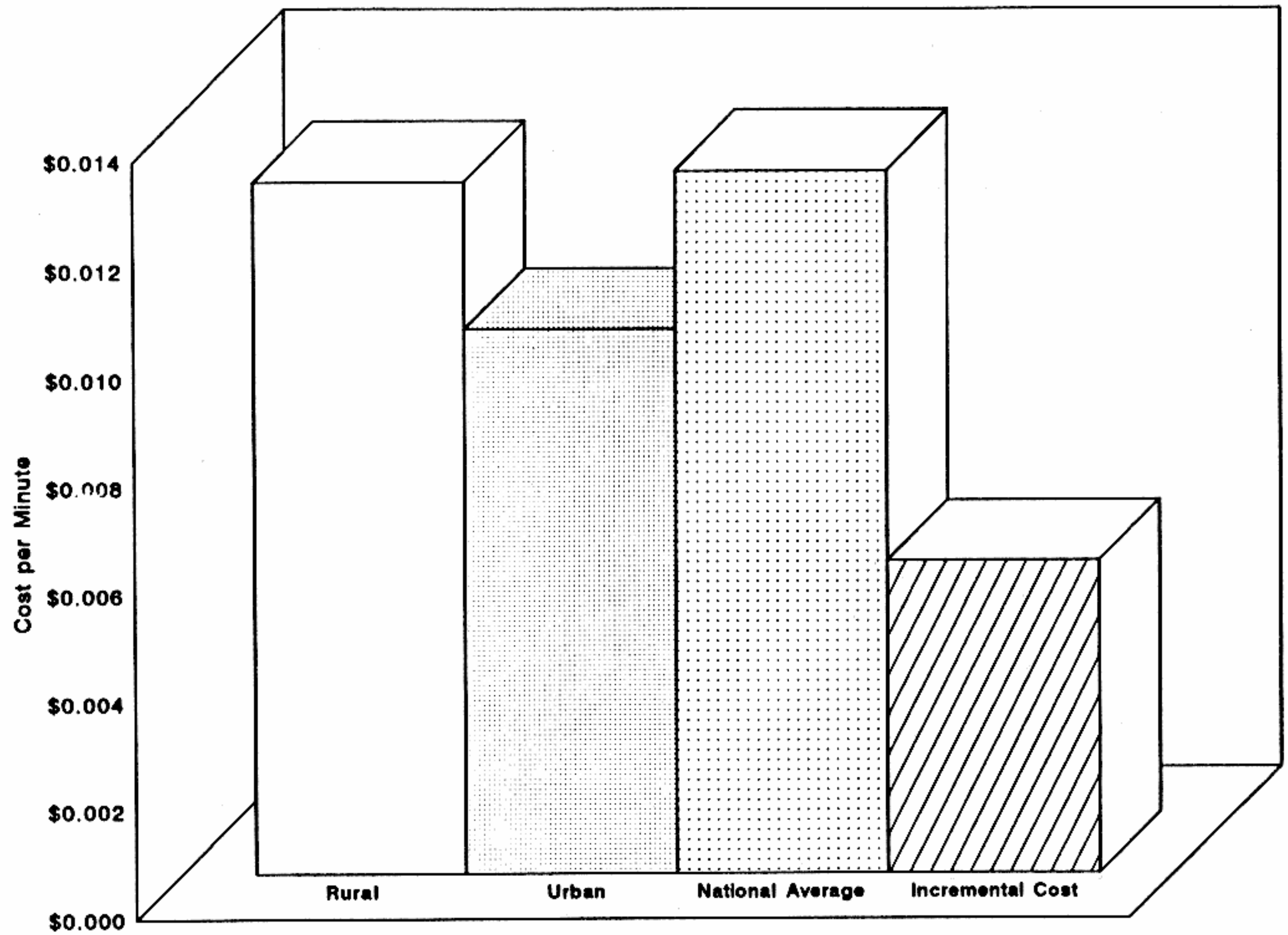


Figure 26
Potential Rate Deaveraging for End Office Switching



Source: Amounts were calculated using the Data Analysis Tool (DAT).

basis.[32] Prices based on average incremental costs would generally collect revenues less than total cost, so the average incremental costs alone are not sufficient to show where the average market price might be. However, companies would have an incentive to lower rates to large customers to the vicinity of average incremental cost. If companies were to do so, they would need to increase rates to other customers, or decrease costs, to maintain earnings.

Figure 27 illustrates the potential rates for residual customers if rate deaveraging occurs. The chart assumes that some customers would receive rates at average incremental cost. The percent of traffic that would have rates equal to average incremental cost is shown on the x-axis. The remaining customers would pay residual rates.[33]

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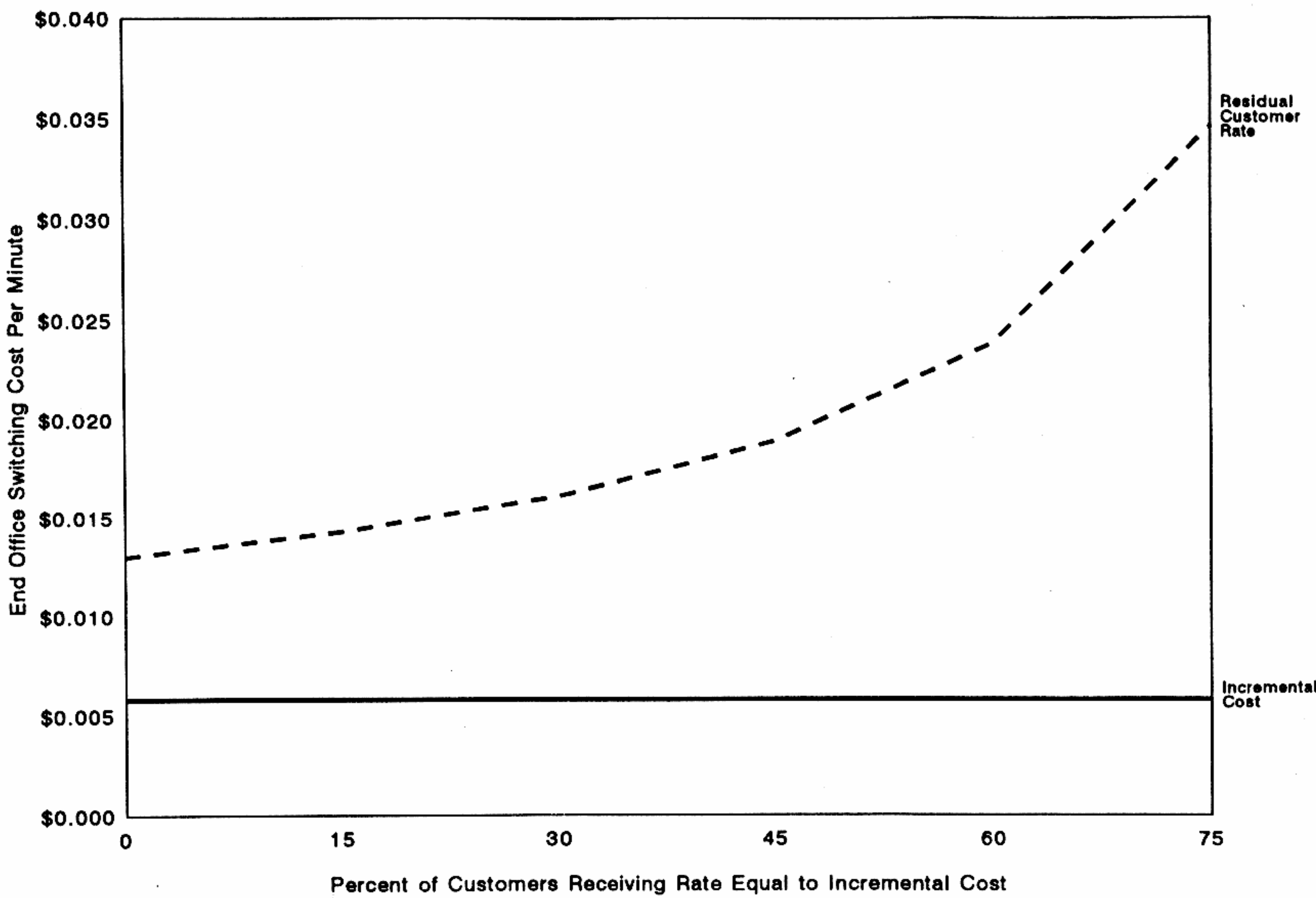
[32] Average incremental cost is the "additional annualized investment cost of a lump of capacity divided by the effective quantity of output made possible by that additional capacity, plus the per-unit operating expenses." (Bridger M. Mitchell, *Incremental Costs of Telephone Access and Local Use*, The RAND Corporation, Santa Monica, CA, July 1990, pp. 13-14.)

Development of average incremental cost per minute:

The following calculations were used to derive average incremental cost for the end office switch. Annual average incremental cost for business customer usage ($14.00 to $21.00 per year) and billing ($6.00 to $9.00 per year) (Mitchell, *Incremental Costs*, Tables 9 and 12, pp. 46 and 48.) were used to develop an average cost per month ($2.42 per month). Billed local minutes for business (417 minutes per month) (Mitchell, *Incremental Costs*, Table 14, p. 53.) were divided into the monthly cost to produce an average incremental cost per minute ($0.0058 per minute).

[33] **Figure 27** contrasts interstate local switching cost per minute with average incremental cost. End office services which have an average cost different that the interstate amount for local switching would have different results.

Figure 27
Potential Rates for End Office Switching for Residential Customers



C. Supports

The FCC proposed a local transport RIC in part because the FCC believed that there may be an over allocation of costs to local transport. If similar conclusions were reached for end office switching, it may be logical to propose an end office RIC. Also, because competition for end office switching would make it problematic to charge at the end office switch for the local transport RIC, it may be logical to place the charge somewhere else in the network. It would not be surprising if it were proposed that either or both of these charges be placed onthe end user. Such charges would have implications for universal service, competition for loops, and broadband deployment.[34]

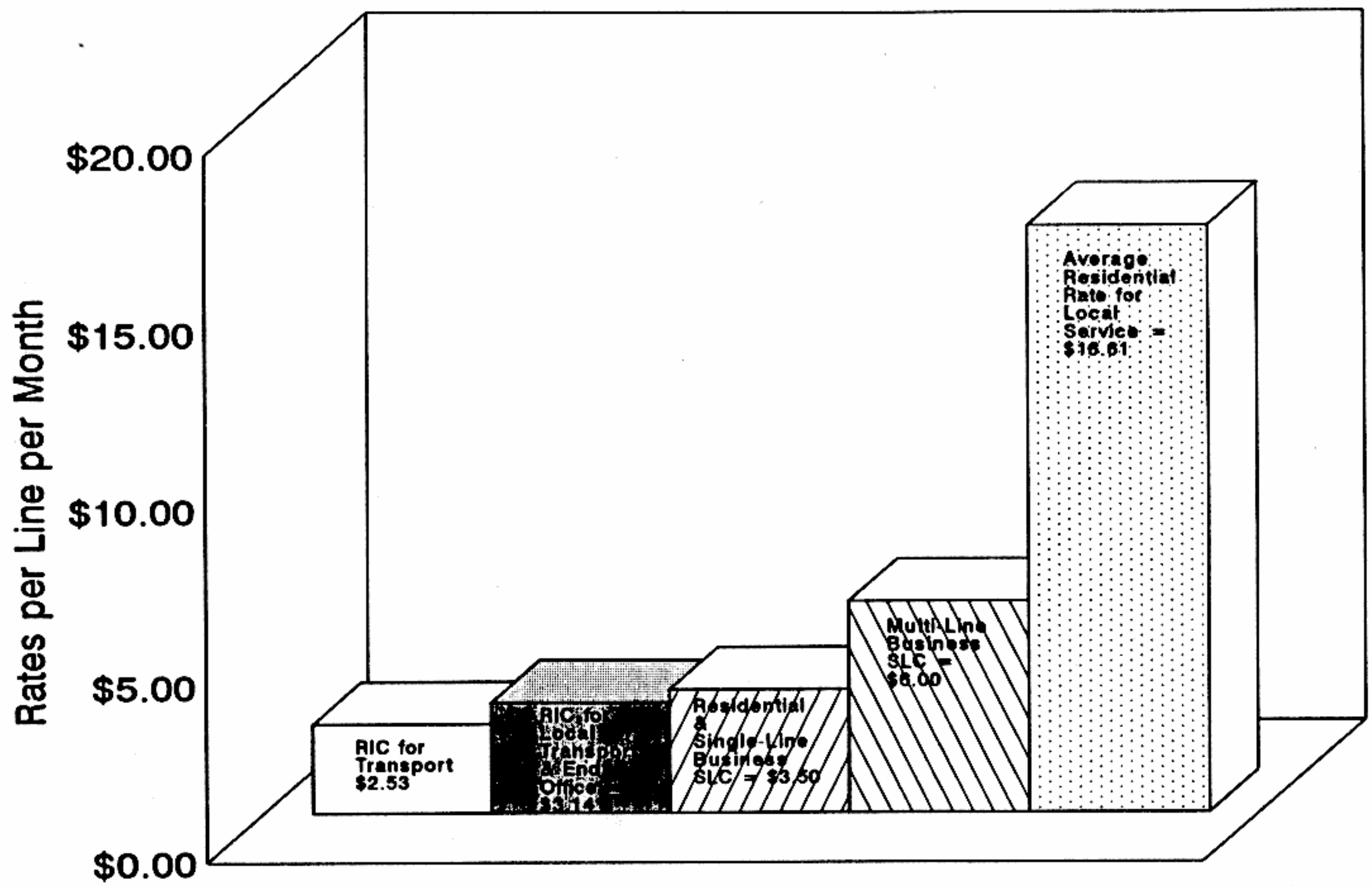
Figure 28 illustrates RICs charged directly to end users. The first bar shows what the RIC could look like if it included both local transport and end office switching.[35] The second bar shows what the local transport RIC might look if it alone were an end user charge. Typical local exchange rates and current interstate SLCs are also shown in **Figure 28** to illustrate orders of magnitude.

[34] High end user charges could increase end user resistance to paying for LEC broadband deployment.

[35] Development of a hypothetical RIC for end office switch:

To develop the local switch RIC, the average incremental cost is multiplied by the local switching minutes of use. This product is subtracted from the local switching revenue requirement to develop the hypothetical end office RIC. This hypothetical end office RIC, added to the local transport RIC, produces a RIC per access line for these two elements.

Figure 28
Comparison of RIC with Existing Subscriber Rates



<u>*Sorce:*</u> The Local Transport RIC is equal to 80% of the Local Transport Revenue Requirement calculated by the Data Analysis Tool (DAT). The End Office RIC was calculated by the DAT. The SLCs are based on current Part 69 Rules.

Effects of Competition for Local Loop

A. Cost Recovery and Allocation

1. Subscriber Line Charges and Carrier Common Line

Two LEC rates that could be affected by local loop competition are the SLC and the CCL. The SLC is an interstate charge for using local loops to access the interstate network.[36] The CCL is an interstate charge to IXCs for using loops to originate and terminate traffic. Most states also have CCL charges.[37]

Higher SLCs could have the effects on universal service, loop competition, and modernization mentioned above. Higher CCL rates are sometimes thought to encourage bypass of the local network and to uneconomically suppress usage of the network.

Separations assigns 25% of the costs classified as non-traffic sensitive[38] (NTS) to the interstate jurisdiction.[39] The FCC's rules provide for those costs to be recovered through SLCs and the CCL. The SLCs are set at $3.50 per line for residence and single-line business customers, and $6.00 per line for multi-line

[36] CC Docket No. 78-72, Phase I, *MTS and WATS Market Structure*, FCC *Third Report and Order*, 93 FCC 2d 241, February 28, 1983, pars. 249, 253-54.

[37] Data on intrastate CCL rates and rate development are not readily available, so only interstate charges are addressed herein.

[38] NTS costs include subscriber common lines (C&WF Cat 1.3) and exchange line circuit equipment excluding wideband (COE Cat 4.13).

[39] More is allocated through the USF, but those costs are not recovered through SLC or CCL charges.

business customers.[40] For the NTS costs assigned to interstate, the residual not recovered through the SLCs is recovered through the CCL.

A decrease in demand for LEC local loops would decrease the revenues collected from SLCs. It is not clear whether it would also lower the revenues collected from CCL, because the CCL is charged at the end office switch, not the loop. CCL revenues would be lost if customers using AP loops did not connect to the LEC end office.

To estimate possible effects of local loop competition on CCL and SLC, assumptions must be made about loops subject to competition and traffic associated with those loops. **Figures 29** and **30** illustrate the assumptions made. **Figure 29** shows the assumed relative proportions of residence, single-line business, and multi-line business loops. It is assumed that competition is for multi-line business loops, only. **Figure 30** shows the assumed distribution of traffic by type of customer.[41]

Figure 31 illustrates possible effects of local loop competition. The chart shows how much LEC SLC revenue and CCL revenue could be lost for different changes in demand for LEC loops. It is assumed that SLC and CCL rates remain constant and that CCL minutes are lost. **Figure 32** shows what would happen to the CCL rates if SLC rates were held constant, but CCL rates were allowed to change to keep LEC SLC plus CCL revenues constant. This is basically the scenario that would be played out for cost companies under Part 69 rules.

The FCC has historically wanted to keep CCL rates down. If the FCC were to continue that practice, there could be pressure to increase SLCs, especially

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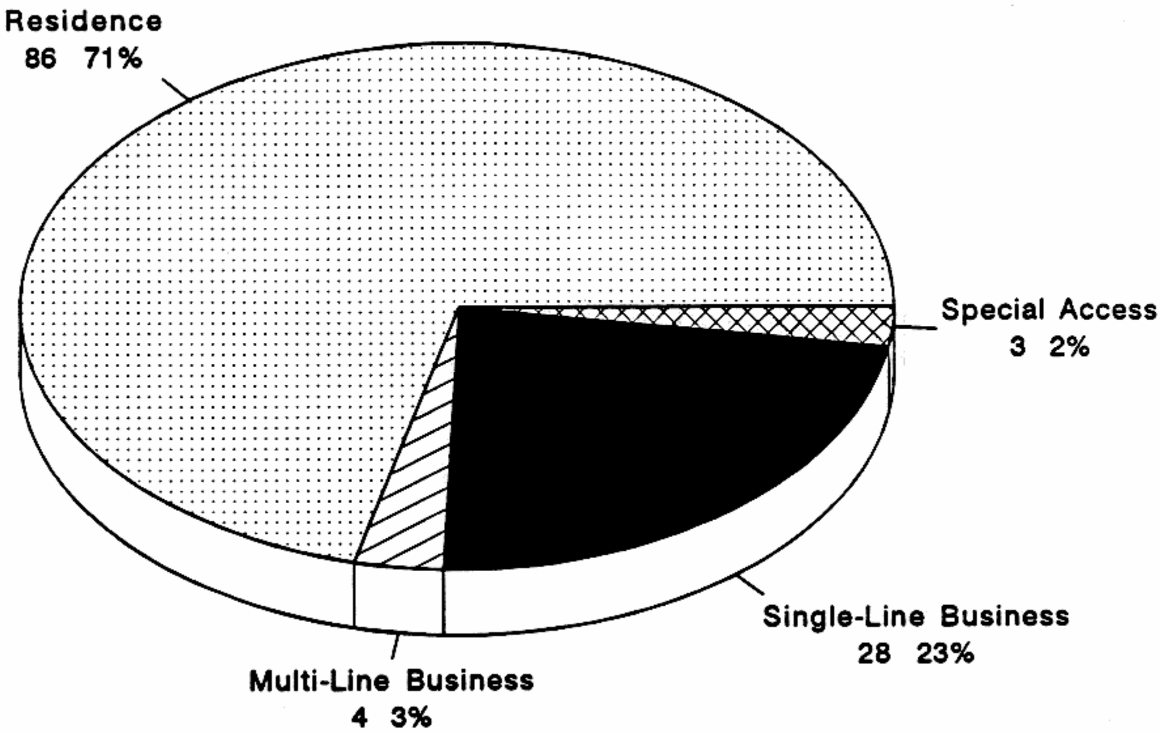
[40] These are maximum rates. Rates may be lower for a study area that has low costs.

[41] Residence toll traffic per line was assumed to be 50% that of business (Mitchell, *Incremental Costs*, Table 14, p. 53.). Multi-line business and single-line business were assumed to have equal amounts of toll traffic per line.

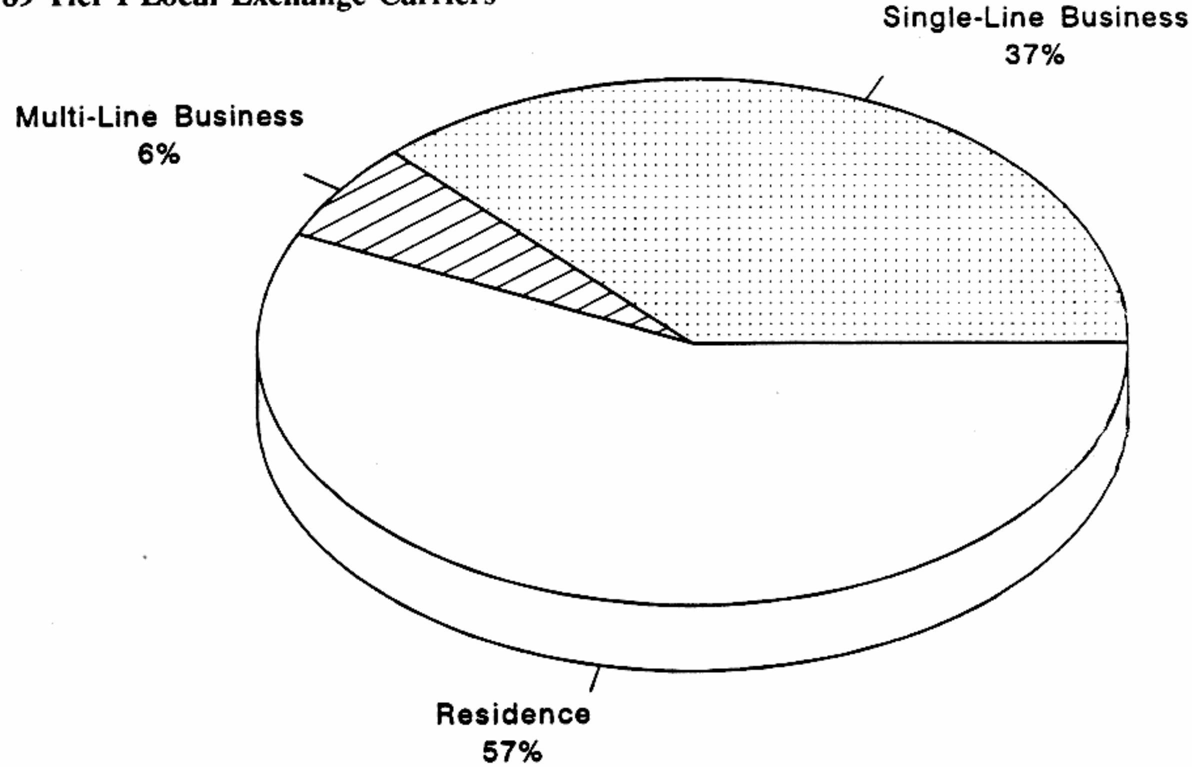
Figure 29
Distribution of Access Lines by Customer Class



Total Number of Access Lines
121 million

SOURCE: FCC Schedule 3 and 1989 Annual TRP data.

Figure 30
Calculated Distribution of Traffic by Customer Class: 1989 Tier I Local Exchange Carriers



SOURCE: FCC Schedule 3 and 1989 Annual TRP data. Residence toll traffic per line was assumed to be 50% that of busines (Mitchell, Incremental Costs, Table 14, p. 53.). Multi-line business and single-line business were assumed to have equal amounts of toll traffic per line.

Figure 31
Change in CCL and SLC Revenues Due to Change in Multi-Line Business Demand

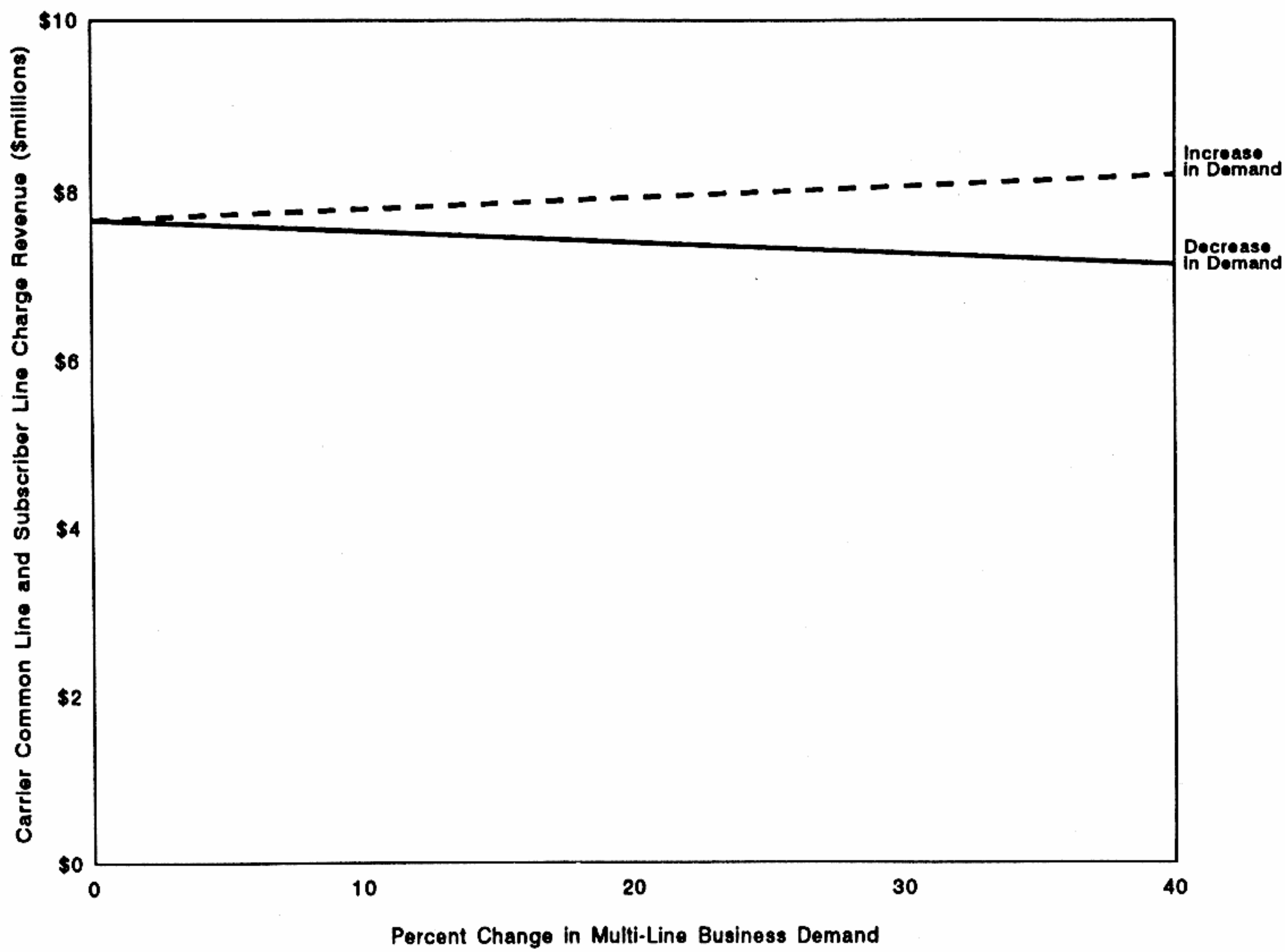
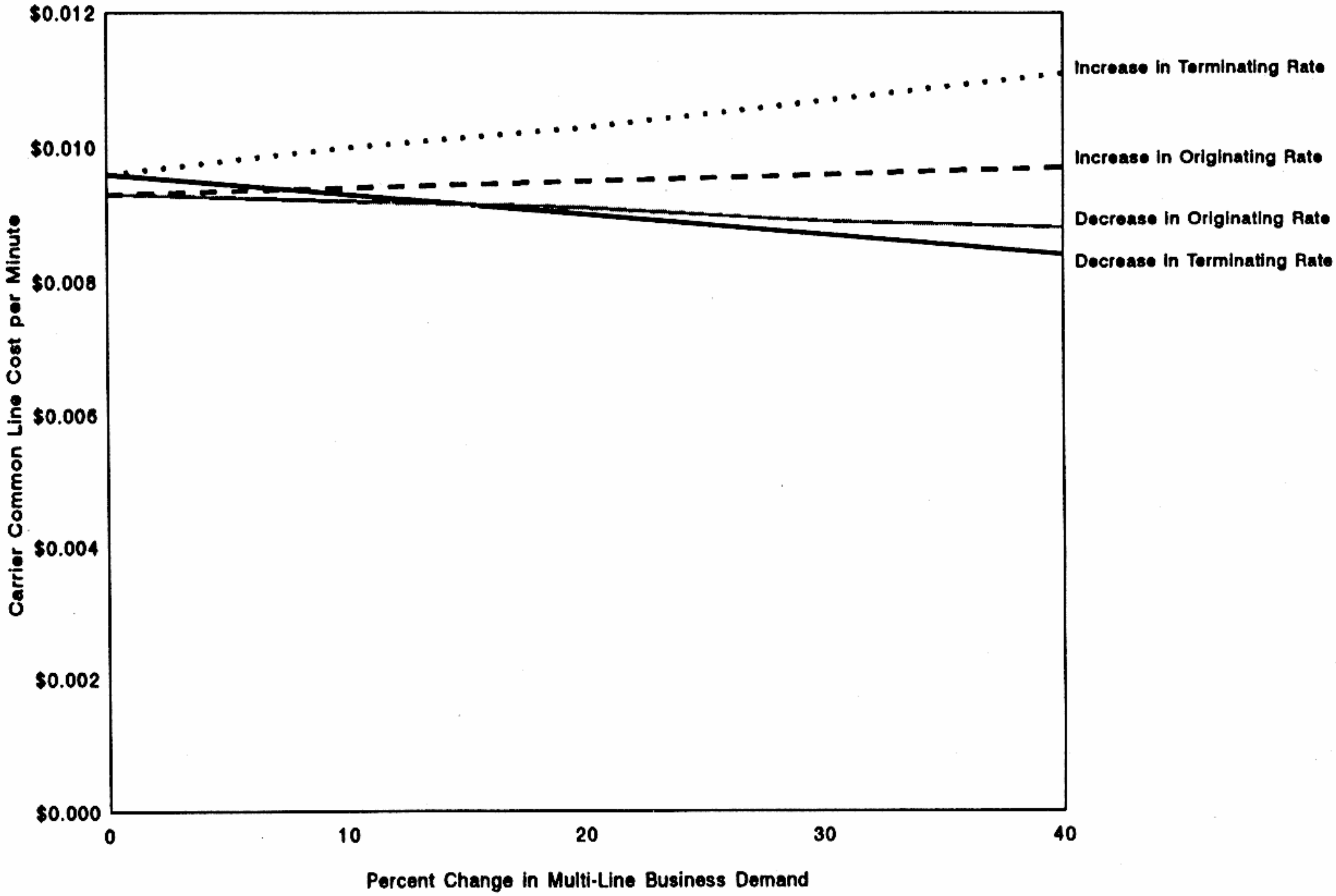


Figure 32
Change in CCL Due to Loss of Multi-Line Business Demand



residential SLCs. **Figure 33** illustrates how residential and single-line business SLCs would increase if CCL rates were held constant, but the SLC rates were allowed to change to keep LEC SLC plus CCL revenues constant.

Higher SLCs could adversely affect universal service. **Figure 34** illustrates possible effects on telephone penetration.[42] Estimates of end user response to increases in prices vary, and none have been estimated in situations where there is competition. **Figure 34** illustrates only one range of possible end user responses. The actual effects could be higher or lower, and could be affected by other prices such as connection charges and toll rates. Also, customers dropping LEC local exchange service would most likely be low income residential customers and end users with competitive alternatives (most likely multi-line business).

2. Basic Service Revenues

Intrastate basic service revenues are dependent upon customers being connected to a LEC local loop.[43] Therefore, if competition for local loops were to decrease the demand for LEC basic service, revenues from those services would decrease. Unless intrastate revenues were allowed to decrease by a comparable amount, rates or sales of other intrastate services may need to increase to maintain earnings. Another alternative would be for the LECs to decrease costs.

[42] Development of percent change in households without telephones:

Percentage changes in SLC rates were combined with the nation wide average local rate for residence service ($16.61 per month) (Weighted monthly average calculated from FCC, Common Carrier Bureau, *Telephone Rates Update*, Washington, D.C., February 27, 1992, Table A4-1.) to estimate a percent change in price. The percent change in price was multiplied by estimates of the price elasticity of demand for local service (-0.20 and -0.05) (Range selected based on Lester D. Taylor, *Telecommunications Demand: A Survey and Critique*, Ballinger Publishing Company, Cambridge, MA, 1980, Table 3-1, p. 80.) to adjust the starting household penetration rate (93.4% of households) (CC Docket No. 87-339, *Monitoring Report*, Table 1.2, p. 25.). The adjusted figure was subtracted from 100% to determine the percent households without telephones.

[43] Indeed, one view is that local exchange service is primarily a leasing of a local loop to the end user. Another view is that the loop is an input or shared cost of many services.

Figure 33
Potential Effects of Loss of Multi-Line Business on SLCs

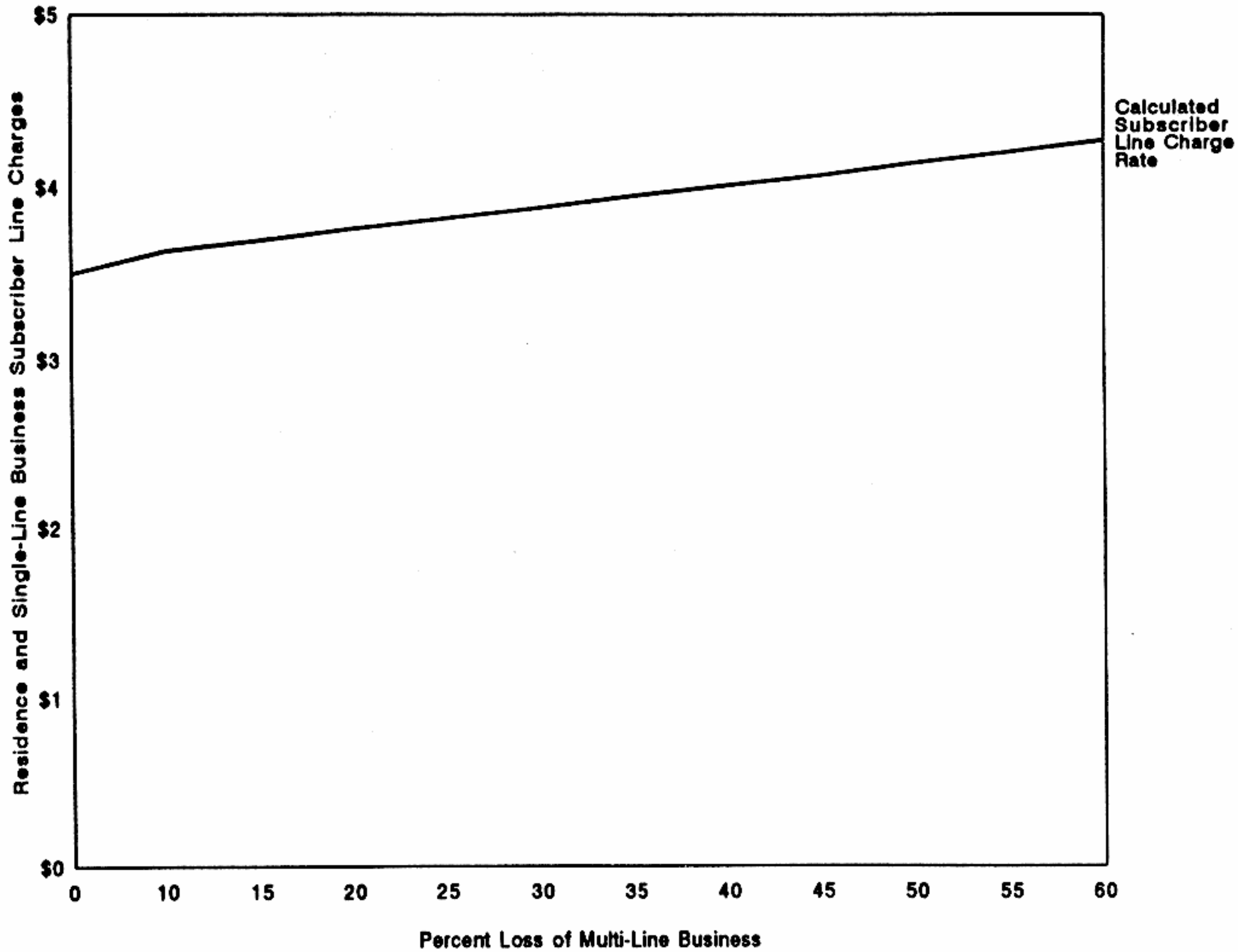


Figure 34
Impact of Household Penetration Based on Increases in Subscriber Line Charge Rates

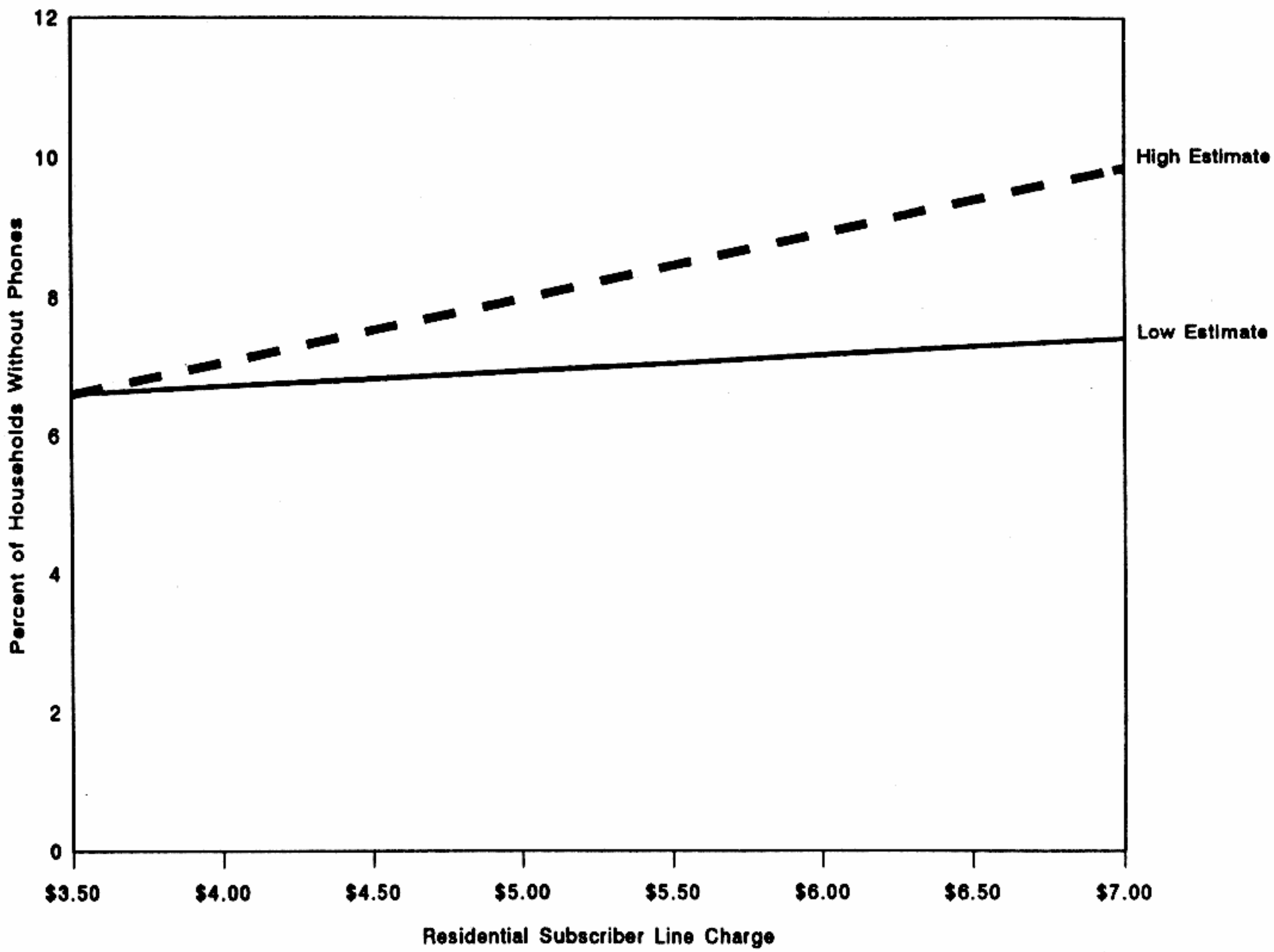


Figure 35 illustrates possible affects on rates for other intrastate services if demand for LEC multi-line business basic service decreases. Two scenarios are shown. First, it is assumed that all revenue losses are made up by increases in rates for single-line business and residence basic service. In this scenario every 10% loss of multi-line business would result in a 3.5% to 4% increase in single-line business and residence rates. Second, it is assumed that 50% of the revenue loss is made up by single-line business and residence basic service. In this situation, the rates increase slightly less than 2% for every 10% loss in multi-line business.

B. Averaging

Basic exchange rates are generally averaged, both across exchanges and across distances.[44] One exception is Centrex service, where charges very with distance from the LEC end office, sometimes by relatively fine increments.

As with local transport and end office switching, competition and expanded interconnection for local loops would provide LECs incentives to deaverage rates. Rates would likely be higher for areas that have higher costs, and for customers that have fewer competitive alternatives.

Figure 36 illustrates potential rate deaveraging for services that cover loop costs.[45] The chart shows the average NTS cost per line for large urban, small urban, large rural, and small rural study areas, as well as the national average. It

[44] Some jurisdictions have banded rates so that customers that are distant from the center of the exchange pay higher rates than customers that are nearer the center.

[45] The primary services that cover loop costs are basic exchange service, SLCs, CCL, and special access. **Figure 36** does not illustrate what might happen to a particular service. Rather, it indicates potential orders of magnitude for services as a whole.

Figure 35
Potential Impact on Single-Line Business and Residence Basic Rates Due to Loss of Multi-Line Business

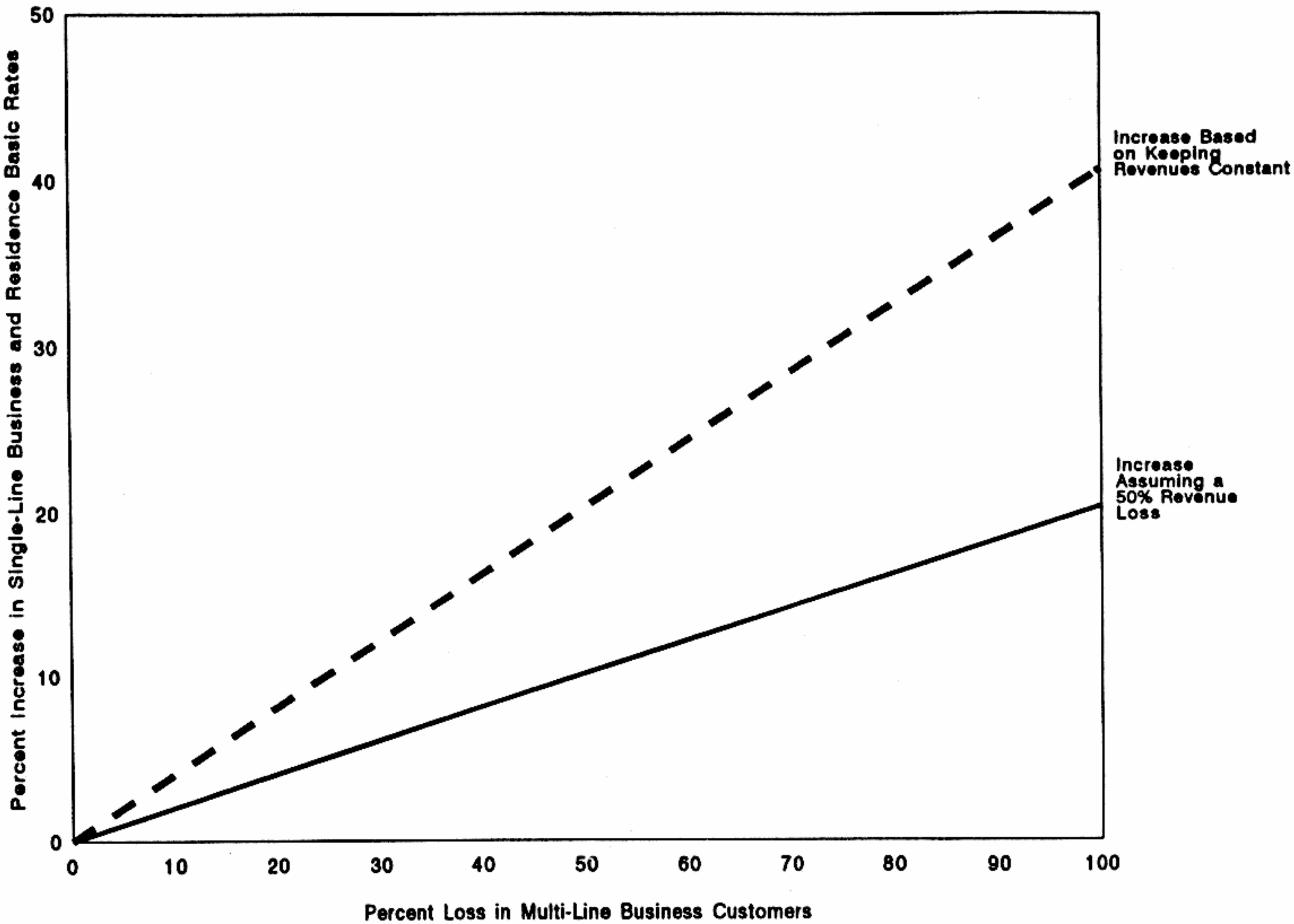
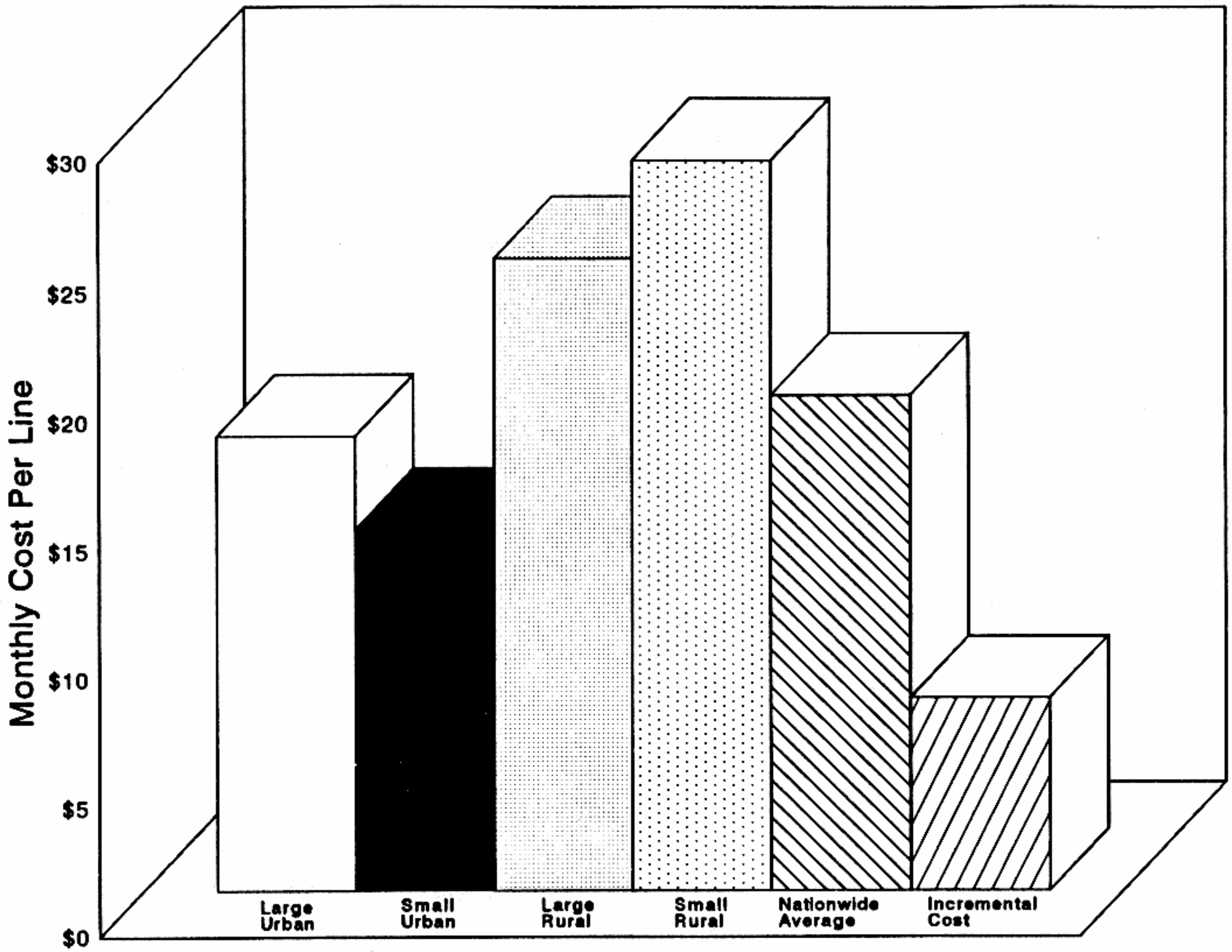


Figure 36
Local Loop Costs



Source: Mitchell, Incremental Costs, Table 12, page 48.

also shows an estimate of average incremental cost.[46] According to these figures, rural area costs are higher than urban area costs. These figures represent potential geographic rate deaveraging. Average embedded costs are approximately 140% higher than average incremental cost. These figures represent potential customer rate deaveraging.

C. Supports: Universal Service Fund (USF)

Effective competition in local loops, end office switching, and local transport would effectively leave no place to collect RIC-like payments; payments to collect revenues — from a customer or a service — in excess of what a competitive market would allow.[47] Collection is dependent upon there being some essential functionality that only the LEC can provide, or, in some other way, the LEC having sufficient market power to charge prices above competitive levels. So to the extent embedded cost may be greater than economic cost, it is unlikely that regulation could provide a RIC-like support mechanism.

The USF is a current support mechanism that could be affected by loop competition.[48] The USF is an extra allocation of NTS costs to the interstate jurisdiction for companies that have high NTS costs in one or more study areas.[49] The size of the allocation allowed depends upon the number of loops the LEC

[46] Mitchell, *Incremental Costs*, Table 12, p. 48. This estimate includes billing costs. The same billing costs were included in average incremental costs for usage.

[47] The primary remaining source would be telephone numbers, and that would be true only if they remained the property of the LECs.

[48] Long Term Support paid to the NECA CCL pool is not modeled, but could be a significant issue. The revenue requirement for the pool is approximately $460 million, $328 million (70%) of which is covered by Long Term Support payments.

[49] The allocation is done on a study area basis.

has in the study area, and the percent by which the study area NTS costs per loop exceed the national average. An increase or decrease in the size of the USF would have a similar affect on intrastate revenue requirements. In some instances there would also be similar affects on the amount of USF monies individual companies receive.

Competition in the local loop could affect the USF by changing the average NTS cost per loop. LECs facing competition may accelerate modernization of their loop facilities, which could increase NTS costs.[50] Also, competition could decrease the demand for LEC loops. Both of these results would increase the NTS cost per loop for those LECs, and increase the national average.

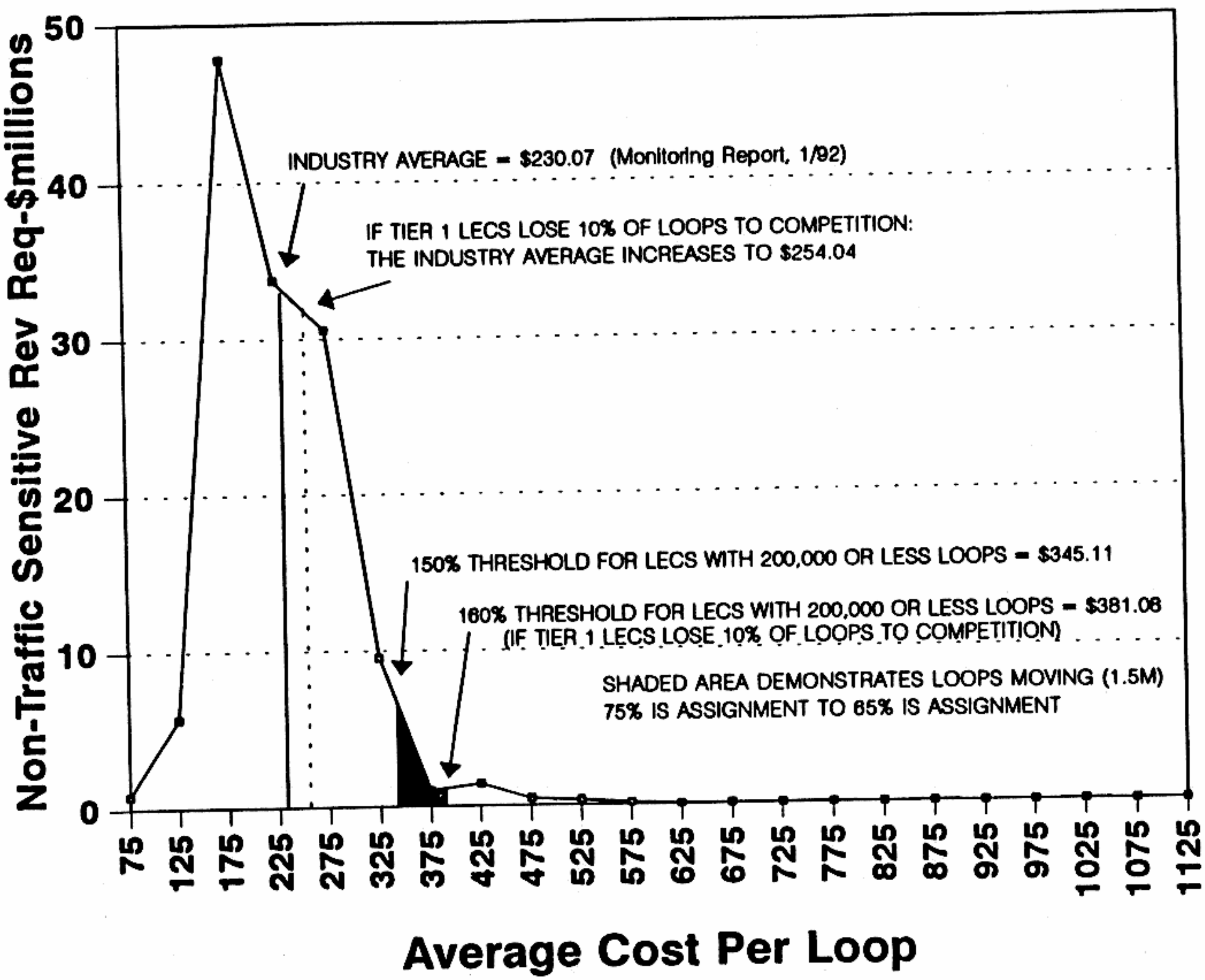
On the other hand, competition could provide LECs with an incentive to be more cost efficient, which could decrease NTS costs. Likewise, competition could stimulate the market demand for loops, which could result in an increase in number of LEC loops. Both of these results would decrease NTS cost per loop for those LECs, and decrease the national average.

Figure 37 illustrates potential USF effects of one of the above scenarios — decreasing the demand for LEC loops. The graph shows the distribution of loops according to their NTS cost per loop. The shaded area illustrates the effect of the large LECs losing 10% of their loops (comparable to losing two-thirds of their multi-line business loops), assuming total NTS cost remains constant.[51] Increasing the NTS cost per loop for the large LECs increases the national

[50] Accelerated modernization could decrease NTS costs. This would be true if the learning curves for the new technologies were such that the material, installation, and maintenance costs were to drop significantly because of economies of scale and experience.

[51] A 10% decrease in loop demand is equivalent to an approximately 10.5% increase in total NTS cost.

Figure 37
Potential USF Effects



average from $230 to $254.[52] This decreases the number of loops qualifying for USF assistance (because qualification is based in part on the amount of a study area's NTS cost per loop that exceeds the national average), which decreases the size of the USF. This would primarily affect smaller companies whose NTS cost per loop would have remained constant.

Although not specifically calculated and shown, the shaded area is also useful for illustrating the potential effect of comparable increases in numbers of loops, or decreases in NTS costs. A decrease in the national average NTS cost per loop would cause the shaded area to shift to the left. The number of loops qualifying for USF assistance would increase, which would increase the size of the USF. The relative magnitude of the increase in USF would be larger than the decrease discussed above because the number of loops corresponding to relevant NTS cost per loop is higher.

Figure 37 illustrates these effects, but does not calculate them. The precise effect would depend upon how the average cost change was distributed across companies and study areas.[53]

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[52] Increasing the NTS cost per loop of one or more study areas also affects the shape of the distribution. This is not illustrated because, in this instance, the change should be primarily to the area that does not receive USF assistance.

[53] Other effects of changes to the size of the USF result from how it is funded. Currently, USF is funded by charges against interexchange carriers that have more than 0.05% of the nation wide presubscribed lines. The USF charge is an amount per line, calculated by dividing the total USF by the number of lines presubscribed to those interexchange carriers. These effects by themselves may not be important because the carriers appear to be less sensitive to the charge per line than to the total USF and what share each interexchange carrier must pay. Alternative methods of collecting monies for the USF are not modeled in this paper. The issue has been raised, however, in at least two current FCC dockets where the FCC is implementing the Americans with Disabilities Act and determining methods for compensating owners of coin operated telephones for long distance calls that dial around the telephone's presubscribed IXC.

IV. Conclusion

Conclusion

There appear to be mismatches between the old wineskins of traditional industry and regulatory methods, and the new wine of competition and interconnection. Regulation has traditionally applied relative use factors to accounting costs for the purpose of developing jurisdiction and service costs. The effect of this, in the presence of competition and interconnection, is to shift costs to residual customers and jurisdictions without respect to why the costs were incurred or who they benefit. This can negatively affect these customers and jurisdictions. It also lessens the ability of competition to eliminate inefficiency from the market, and it increases LEC unit costs when competition decreases demand for LEC services.

Competition and interconnection also clash with traditional methods of rate averaging and with various support mechanisms. Rate averaging has been accomplished through aggregation of costs into accounts, and then spreading these costs to services and areas through relative use allocators. These mechanics may produce anomalous results when services are unbundled and when usage patterns fluctuate. Rate averaging itself is jeopardized because market entry would be encouraged primarily in low cost areas, putting downward pressure on LEC rates in these areas. Support mechanisms have been traditionally tied to use of one or more parts of the LEC network. Contributions to these mechanisms could be put at risk if these portions of the LEC network can be avoided.

Some of the practices of the traditional system may still be appropriate with what is going on in the industry, and some practices may be inappropriate. The key is for policy makers to separate what they want to retain from what they want to discard as no longer being relevant. The first step is to define objectives in terms that are clearly understood by all interested parties. The next step is to consider options, some of which could include:

- Defining the scope of competition and interconnection as regulatory tools.

IV. Conclusion

- Adopting new costing standards or other methods for controlling rates, including increased use of competition.
- Redefining basic service.
- Retargeting support mechanisms.
- Implementing more general methods of funding support mechanisms.
- Limiting regulation to the essentials necessary to protect more captive customers and facilitate competition.

These are but a few of the options that policy makers could consider. Whatever solutions are chosen should be developed with broad input and analysis of the actual effects.

Appendix A

Figure 38
Interconnection Points and Facilities

Points of Interface[54]

For the carrier network

- Network termination at the end user premise
- Serving area interface
- Subscriber main distributing frame in the end office
- Software interface in the end office switch
- Software interface in the end office cross-connect
- Trunk main distributing frame in the end office
- Main distributing frames in the tandem
- Software interface in the tandem switch
- Software interface in the tandem cross-connect
- Interexchange carrier point of presence

For the signaling network

- Service switching point
- Service control point

Substitutable Facilities

For the carrier network

- Any of the points of interface
- Loop distribution plant
- Loop feeder plant
- End office switch
- Software modules within the end office switch
- End office cross-connect
- Software modules within the end office cross-connect
- Interoffice trunks
- Tandem switch
- Software modules within the tandem switch
- Tandem cross-connect
- Software modules within the tandem cross-connect

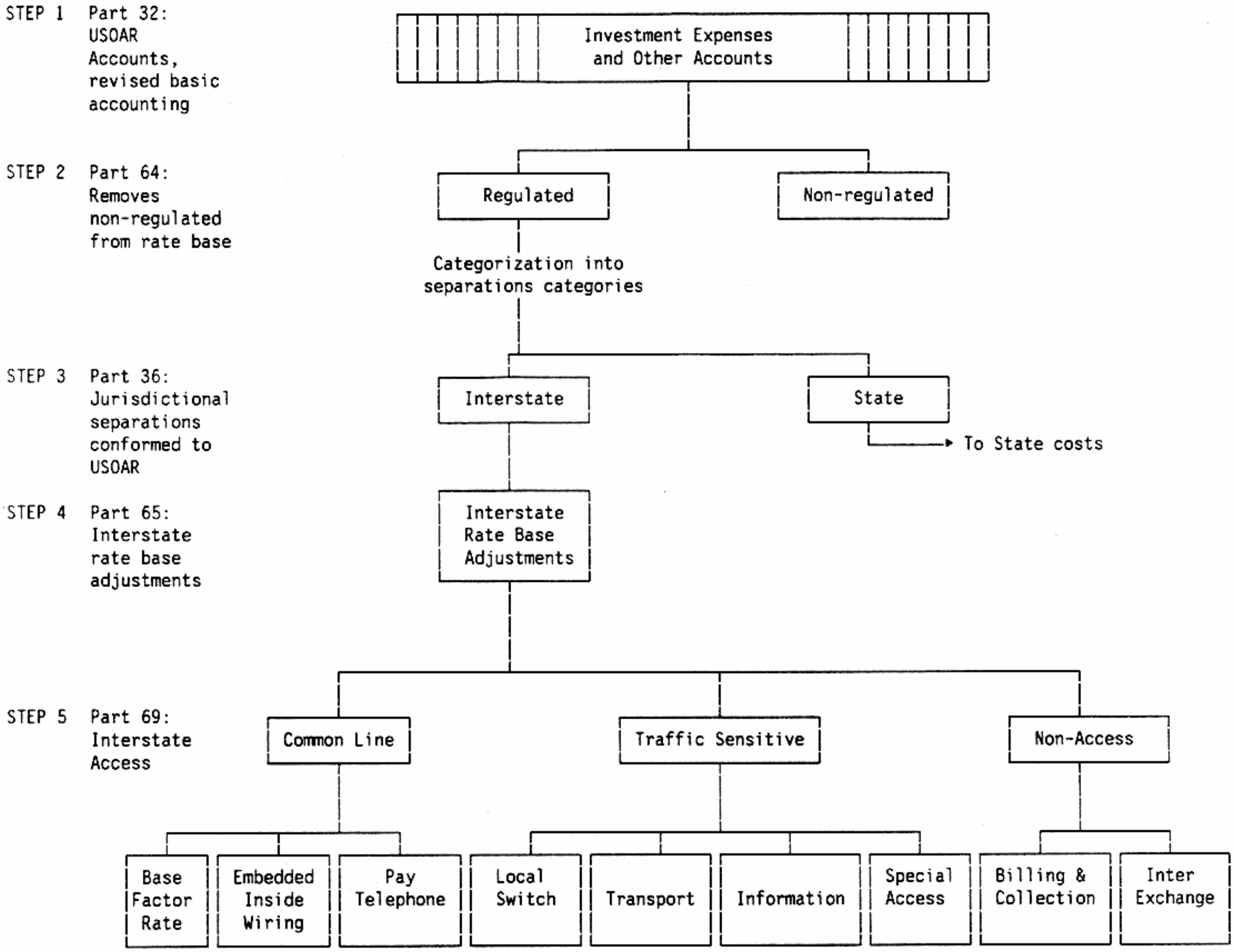
For the signaling network

- Any of the points of interface
- Signal transport
- Any software or data modules

[54] Hatfield, "Open Network Architecture," Figures 1-5, pp. 27-37.

Figure 39
Federal Communications Commission (FCC) Rules for Distribution of LEC Costs

FCC Rules | **Cost Process**



Step 1: Accounting rules place LEC investments, expenses, and other costs into specific USOAR accounts (Part 32).

Step 2: Part 64 rules remove non-regulated costs.

Step 3: LECs categorize all of their regulated costs by account into separations categories (Part 36) for division between state and interstate jurisdictions.

Step 4: Part 65 performs interstate rate base adjustments (allowances and disallowances).

Step 5: Interstate access rules (Part 69) categorize the remaining interstate costs. (These rules have implications for intrastate as well.)

Appendix B

Cost Reductions and Plant Fungibility

Cost avoidance is estimated for two situations: (1) Reduced growth in demand; and (2) Absolute reductions in demand. This is done for access lines, end office switching, and local transport.

There are three caveats:

1. Expense savings are calculated from embedded cost relationships.
2. Plant Specific maintenance expenses directly related to plant capacity (investment).
3. Investment increases driven by technology needs are not considered. Therefore, investment savings are overstated.

The methods used to estimate the cost reductions were as follows:

Reduced growth.

It is assumed that for the incremental cost savings of reduced growth rate, that the incremental cost of one less unit is equal to the incremental cost of one additional unit beyond the current capacity. For loop, this was estimated as follows.

Expenses by account.

a. Acct 6620 Services: End User Service Order Processing; End User Payment and Collections; End User Billing and Inquiry; Message Processing; Other Billing and Collection.
b. Acct 6530 Network Operations: Acct 6534 Plant Operations Administration.
c. Acct 6210 Central Office Switching.
d. Acct 6230 Central Office Transmission.
e. Acct 6410 Cable and Wire Facilities.

Expense accounts affected by reduced growth in new service, reduced growth in calls for repair, reduced growth in accounts to service for billing, billing inquiry, and reduced growth in message detail on statements.

Investment by account.
a. Acct 2210 Central Office Switching.
b. Acct 2230 Central Office Transmission.
c. Acct 2410 Cable and Wire Facilities.

Investment accounts are affected by reductions in growth. Savings are in terms of delayed increases in capacity.

For end office switching, this incremental cost savings was estimated as follows:

Expenses by account.
a. Acct 6620 Services: End User Billing and Inquiry; Message Processing; IXC Service Order; IXC Billing Inquiry.
b. Acct 6210 Central Office Switching.

Expense accounts are affected by reduced growth in switching capacity, which is the main driver of switch maintenance expense.

Investment by account.
a. Acct 2210 Central Office Switching.

Investment accounts are affected by reductions in growth. RAND[55] incremental switch investment for local usage could be used for model inputs with FCC Monitoring Report data[56] for minutes of use growth.

[55] Mitchell, *Incremental Costs*, Table 9, p. 46.

[56] CC Docket No. 87-339, *Monitoring Report*, Tables 4.9-4.11.

For local transport, this incremental cost savings was estimated as follows:

Expenses by account.
a. Acct 6620 Services: IXC Service Order Processing; IXC Billing and Inquiry.
b. Acct 6230 Central Office Transmission.
c. Acct 6410 Cable and Wire Facilities.

Expense accounts are affected by reduced growth in inter-office trunk capacity, which is the main driver of transport maintenance expense.

Investment by account.
a. Acct 2230 Central Office Transmission.
b. Acct 2410 Cable and Wire Facilities.

Investment accounts are affected by reductions in growth. Savings are in terms of delayed investment increases to meet the slowing capacity growth requirements.

Absolute Reductions in Demand.

It is assumed that incremental cost savings for absolute reductions in demand are the avoidable costs if the current network design capacity for loop, switching and transport based services exceeds the post-competitive demand. For loop, this is estimated as follows.

Expenses by account.
a. Acct 6210 Central Office Equipment Switching Plant Specific Expense.
b. Acct 6620 Services: End User Service Order Processing; End User Payment and Collections; End User Billing and Inquiry; Message Processing; Other Billing and Collection.
c. Acct 6530 Network Operations: Acct 6534 Plant Operations Administration.

d. Acct 6230 Central Office Transmission.
e. Acct 6410 Cable and Wire Facilities.

Expense accounts affected by reductions in demand for: new service, calls for repair, accounts to service for billing, billing inquiry, and message detail on statements. Rand incremental expense costs could be used for model inputs.

Investment by account.

If one assumes that customers who use competitors loop services are not concentrated by location, then this leads to the conclusion that loop cable and wire investment is not fungible. The COE transmission investment account is affected on a very limited basis. Some savings could be made at the line-side frame and in line connections.

For end office switching, the cost avoidance is estimated as follows:

Expenses by account.

a. Acct 6620 Services: End User Billing and Inquiry; Message Processing; IXC Service Order; IXC Billing Inquiry.
b. Acct 6210 Central Office Switching.

COE switch maintenance expense accounts are directly related to switch capacity. Since the embedded switch capacity can only be reduced by removing the switch and replacing it with a smaller switch, savings are not likely. The service expenses listed above are message sensitive, thus when the LEC does not switch the message the expense is avoidable.

Investment by account.

Investment reductions are unlikely unless one assumes a percentage of the under-utilized embedded switches can be used in the wire centers nearing their switching capacity. In certain instances, some wire centers may be experiencing growth while other wire centers are not. It may be economically feasible to move switches to meet these uneven capacity constraints.

For local transport, the cost avoidance is estimated as follows:

Expenses by account.

a. Acct 6620 Services: IXC Service Order Processing; IXC Billing and Inquiry.
b. Acct 6230 Central Office Transmission.

Maintenance expense accounts are directly related to inter-office trunk capacity. If the embedded inter-office trunk capacity is reduced, there will be reductions in plant specific maintenance and repair expenses.

Investment by account.

a. Acct 2230 Central Office Transmission.

Reductions in embedded cable and wire facilities investment are unlikely, as re-utilization costs exceed the costs of new plant. However, digital COE circuit equipment is more easily removed and reutilized for growth areas.