Exhibit No.:	
Issue:	Geographic Market/Economic Issues
Witness:	Timothy J. Tardiff
Type of Exhibit:	Direct Testimony
Sponsoring Party:	Southwestern Bell Telephone, L.P. d/b/a/ SBC Missouri
Case No.:	TO-2004-0207 Phase I
Date Testimony Prepared:	December 18, 2003

SOUTHWESTERN BELL TELEPHONE, L.P. D/B/A
SBC MISSOURI

CASE NO. TO-2004-0207

DIRECT TESTIMONY

OF

TIMOTHY J. TARDIFF

Cambridge, Massachusetts

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of a Commission Inquiry into the Possibility of Impairment without Unbundled Local Circuit Switching When Serving the Mass Market	))))	Case No. TO-2004-0207

AFFIDAVIT OF TIMOTHY J. TARDIFF

COMMONWEALTH OF MASSACHUSETTS)

COUNTY OF MIDDLESEX)

I, Timothy J. Tardiff, of lawful age, being duly sworn, depose and state:

1. My name is Timothy J. Tardiff. I am presently a Vice President – National Economic Research Associates.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge and belief.

Timothy J. Tardiff

Subscribed and sworn to before me this 15th day of December, 2003.

Notary Public

My Commission Expires:

SILVIA SANTOS
NOTARY PUBLIC
My commission expires Sept. 24, 2004

TABLE OF CONTENTS

Page

I. INTRODUCTION

Q. PLEASE STATE YOUR FULL NAME, EMPLOYER AND BUSINESS ADDRESS.

A. My name is Timothy J. Tardiff. I am a Vice President at National Economic Research Associates, 1 Main Street, Cambridge, MA 02142.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A. I received a B.S. degree from the California Institute of Technology in mathematics (with honors) in 1971 and a Ph.D. in Social Science from the University of California, Irvine in 1974. From 1974 to 1979, I was a member of the faculty at the University of California, Davis. I have specialized in telecommunications economics for over 20 years. My research has included studies of the demand for telephone services, such as local measured service and toll, analysis of the market potential for new telecommunications products and service, assessment of the growing competition for telecommunications services, and evaluation of regulatory frameworks consistent with growing competitive trends.

I have extensive experience as a consultant and expert witness in regulatory proceedings. In particular, I have filed testimonies, affidavits, expert reports, and/or appeared as a witness in over 25 state jurisdictions, at the FCC, and in international proceedings. These proceedings dealt with economic issues involving competition policies, such as unbundling, determining the costs of network elements, establishing policies for universal service funding, and measuring the elasticities of demand for telecommunications

services. I have published extensively on telecommunications economic issues, as shown in my resume (Schedule TJT-1 to this testimony).

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony evaluates, from an economic perspective, the proper way to define the geographic market for determining whether competitive local exchange carriers (CLECs) are "impaired" by a lack of access to unbundled local circuit switching to serve mass-market customers, as contemplated by the FCC's Triennial Review Order ("TRO").[1] I also evaluate the information presented in Mr. Fleming's testimony on entry patterns in SBC Missouri's service areas and conclude that the appropriate geographic markets produced by both economic reasoning and the geographic market definition rule in the TRO are Metropolitan Statistical Areas (MSAs).

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. My testimony has two major sections. First, I explain how economists determine the product and geographic scope of economic markets. Based on an assessment of how competitors enter local exchanges, in general, and the important role marketing and advertising plays in these entry decisions, in particular, the MSA is a reasonable and readily available representation of the geographic scope of such markets for local telecommunication services. Indeed, the FCC itself has used metropolitan areas in a

[1] *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers* (CC Docket No. 01-338), *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996* (CC Docket No. 96-98), *In the Matter of Deployment of Wireline Services Offering Advanced Telecommunications Capability* (CC Docket No. 98-147); Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, FCC 03-36 (released August 21, 2003) ("Triennial Review Order" or "TRO") at ¶ 495-496 and 47 U.S.C. § 51.319(d)(2).

number of recent cases that delineated local exchange markets.[2] Next, I explain how the FCC's specific rule for determining the geography of the markets for analyzing whether mass-market switching should continue to be unbundled leads to the same conclusion that MSAs are the best choice for representing the geographic scope of the relevant markets in Missouri.

II. ECONOMICALLY CORRECT TESTS FOR DEFINING MARKETS TO EVALUATE IMPAIRMENT

Q. PROPERLY PERFORMED, IS THE ANALYSIS OF WHETHER THE ABSENCE OF PARTICULAR TELRIC-PRICED INCUMBENT LOCAL EXCHANGE CARRIER (ILEC) NETWORK ELEMENTS WOULD IMPAIR COMPETITION SIMILAR TO THOSE UNDERTAKEN BY ECONOMISTS AND ANTITRUST AUTHORITIES IN OTHER CONTEXTS?

A. Yes. In fact, the FCC itself has used this general type of analysis in assessing competition, e.g., when it decided to grant AT&T's request for nondominant status in interLATA long-distance markets,[3] when it approved telecommunications company mergers,[4] and when it provided additional pricing flexibility for ILEC interstate special access services.[5]

---

[2] In a number of cases, e.g., in defining metropolitan areas for the purpose of limiting the unbundling of switching in its previous rules (TRO at ¶ 497), in deciding whether to grant price flexibility for certain interstate access services, and most recently, in allowing wireline customers to port telephone numbers to wireless services, the FCC used MSAs—a widely recognized and used standard definition of metropolitan areas.

[3] *In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier*, Order (released October 23, 1995).

[4] See, for example, *In re Applications of NYNEX Corporation Transferor, and Bell Atlantic Corporation Transferee, for Consent to Transfer Control of NYNEX Corporation and its Subsidiaries*, File No. NSD-L-96-10, Memorandum Opinion and Order, Released August 14, 1997 ("*Bell Atlantic-NYNEX Order*")

[5] In the Matter of Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Interexchange Carrier Purchases of Switched Access Services Offered by Competitive Local Exchange Carriers,

Such an analysis would ordinarily include three determinations: (1) a definition of the product and geographic dimensions of the relevant market, (2) identification of the extent of competitive entry that has already occurred in the relevant market; and (3) if necessary, a determination of whether barriers arising from natural monopoly conditions have and will continue to prevent economic entry into the relevant market. Consistent with the scope of this proceeding, my testimony focuses the first of these three determinations. I also interpret from an economic perspective the data that Mr. Fleming presents on the scope of competitive entry.

A. Market Definition: Product and Geographic Dimensions

Q. HOW DO ECONOMISTS DEFINE ECONOMIC MARKETS?

A. As a general matter in assessing competition, the relevant market has two dimensions -- a product market dimension and a geographic market dimension.[6] The product market methodology (and a separate but similar geographic market methodology) is a conceptual process to identify a gap in the chain of substitute products by starting with the most narrow set of products imaginable and then adding products to the set until the set contains all close substitutes. The conceptual test that defines "close substitutes" is whether a hypothetical monopolist of the set of products could profitably impose a small but significant, non-transitory increase in price above the market level. Thus, a properly

---

Petition of U S West Communications, Inc. for Forbearance from Regulation as a dominant Carrier in the Phoenix, Arizona MSA, CC Docket Nos. 96-262, 94-1, CCB/CPD File No. 98-63 and CC Docket No. 98-157. Fifth Report and Order and Further Notice of Proposed Rulemaking, Released August 27, 1999 ("*Pricing Flexibility Order*").

[6] For example, see Department of Justice and Federal Trade Commission *Horizontal Merger Guidelines*, April 2, 1992, Sections 1.1 and 1.2.

defined market will include products to which consumers would switch in substantial numbers if a supplier attempted to charge supra-competitive prices.

This process is used to identify both products that are sufficiently close substitutes (e.g., DSL and cable modem service in broadband markets) and the geographic scope over which firms offering these products compete.

B. Product Market Definition

Q. HOW DID THE FCC DEFINE THE PRODUCT MARKET FOR THIS IMPAIRMENT DETERMINATION?

A. The FCC determined that the product or customer market should be services provided to mass market customers, who "are analog voice customers that purchase only a limited number of POTS lines, and can only be economically served via DS0 loops." [*TRO*, ¶ 497]. Therefore, the FCC has already defined the product for purposes of this proceeding.[7]

Q. IS THE FCC'S DISTINCTION BETWEEN THOSE END-USER SERVICES PROVIDED TO "ENTERPRISE CUSTOMERS" (BUSINESS LOCATIONS WITH MORE THAN A FEW LINES) AND "MASS MARKET" CUSTOMERS (RESIDENCES AND BUSINESS LOCATIONS WITH FEW LINES) REASONABLE?

A. Yes, and this distinction is important when we assess the scope of the geographic market below. Distinguishing between mass-market and enterprise services is consistent with

[7] Note that the product market focuses on the end-user services that ILECs and their competitors provide and not on particular components of the ILEC network. Thus, although the emergence of "wholesale markets" for network components is likely to be sufficient to demonstrate the lack of impairment, such markets are clearly not necessary to make such a determination.

sound economics and previous FCC market determinations (e.g., in the special access price flexibility decision).

From an economic perspective, we examine the potential substitutability of enterprise and mass-market services from the perspectives of both the customers (the demand side) and the suppliers (the supply side). On the demand side, in terms of the familiar standard of the DOJ/FTC *Horizontal Merger Guidelines*, purchasers of mass-market DS-0 services would not shift their demands to high-capacity facilities in response to a "small but significant" increase in the price of their current services, because the minimum monthly cost of high-bandwidth enterprise services far exceeds the cost of meeting their needs with mass-market DS-0 services. Symmetrically, a reduction in the price of DS-0 services would not induce enterprise customers to switch because they would still find it cheaper to supply their needs with DS-1 and higher bandwidth services.

On the supply side, carriers market services differently to enterprise and mass-market customers. Individual marketing representatives typically serve enterprise customers. In contrast, mass-market customers are often reached by mass-market advertising media—radio, television and print.

Thus, the application of the standard economic method of determining a relevant product or service market implies that services supplied to mass-market customers are in a different product market from those supplied to enterprise customers.

C. Geographic Market Definition

Q. HOW DO ECONOMISTS DEFINE A GEOGRAPHIC MARKET?

A. It is a geographic area in which sellers provide products or services that customers treat as substitutes for one another and thus which compete against one another. As a leading text describes the concept:

> The geographic limit of a market is determined by answering the question of whether an increase in price in one location substantially affects the price in another. If so, then both locations are in the same market.[8]

For mass-market local telephone service, carriers offering mass-market local telephone service in the core of an urban area would compete in the same geographic market as carriers offering local service in a close suburb because reductions in local exchange prices in the suburb would lead to lower prices in the core area. For example, a reduction in local exchange rates in the suburb would lead to lower prices in the core area, because carriers advertise and promote mass-market services on a metropolitan-wide basis, and customers in the core area would consequently expect to pay the advertised prices for services. Conversely, if a firm attempted to raise rates in the suburb, a competitor in the core area would quickly expand its business in the suburb using the same switch, placing downward pressure on the prices in the suburb.

[8] D.W. Carlton and J.M. Perloff, *Modern Industrial Organization*, Second edition, (1994), New York: Harper Collins, at 807. Similarly, the *Horizontal Merger Guidelines* (Section 1.2.1) consider firms at different locations to be in the same market when a potential price increase by one firm (assuming other firms maintain their current prices) would be unprofitable, because customers would shift to the products of firms at other locations in the same geographic market.

Q. DOES THE ANALYSIS OF THE GEOGRAPHIC SCOPE OF THE RELEVANT MARKET IN THE CASE OF TELECOMMUNICATIONS DIFFER IN DETAIL FROM THE TYPICAL DELINEATION OF THE GEOGRAPHIC DIMENSIONS OF A PRODUCT?

A. To some extent. The typical case, (e.g., a merger analysis), starts with the products of the firm(s) in question and then poses the question of whether customers would shift to the products of firms *at other locations* in the event of a price increase by the reference firm(s). That is, firms are viewed as having precise locations; consequently, considerations such as transportation costs come into play when determining whether customers would shift their purchases to the competing firms. In contrast, telecommunications carriers have switches that can reach major portions of the geographic market area and market their services throughout the geographic market. For example, in the competition between cable modems and DSL for broadband services, both the cable television company and the telephone company would typically have facilities that covered a large portion of the relevant area. Similarly, CLECs frequently offer service (using resale or UNE-P) in geographic areas where they have no facilities, so the notion of identifying a firm with a location at which it provides service makes less sense for telecommunications carriers than (for example) cement manufacturers.

Q. IN ASSESSING WHETHER ABSENCE OF THE UNBUNDLED LOCAL SWITCHING WOULD IMPAIR CARRIERS IN THE PROVISION OF MASS-MARKET LOCAL EXCHANGE SERVICES, HOW DOES ONE DETERMINE THE GEOGRAPHIC SCOPE OF THE MARKET?

A. In this case, there is a reasonably close alignment with the more traditional geographic market determination. That is, the competing firm can be thought to be located at the location of its switch and to offer the local exchange service product at that location. In

order to reach customers throughout the market, the firm incurs "transportation costs" in the form of outlays for unbundled loops, transport of traffic between its switch and ILEC end-offices, certain non-recurring charges, and the like.

Specifically, from the perspective of the CLEC, two related considerations come into play, which together determine the geographic area in which the CLEC chooses to compete for mass-market services. First, the CLEC incurs fixed costs (costs insensitive to the number of customers) when it chooses to locate its switch and market its services following the contours of the media markets. That is, when a CLEC enters using mass-market advertising, it has implicitly chosen to reach all potential customers in the geographic area served by the media. Thus, to serve mass-market customers, CLECs implicitly offer service to a geographic area consisting of the intersection of the areas (i) served by a switch and (ii) corresponding to media market geographic reach. Second, the CLEC must decide how to serve customers in particular ILEC wire centers to which it has already offered service: whether to incur fixed costs of collocation or to serve the customers through enhanced extended links (EELs). Putting these two types of costs together, the CLEC entrant determines that it is likely to be profitable to serve this area—*i.e.,* the intersection of the reach of a switch and the reach of mass media—given the most efficient way to connect customers in different ILEC wire centers to its switch.

Q. WHAT GEOGRAPHIC AREA WILL THIS ANALYSIS PRODUCE AS A MARKET DEFINITION?

A. As I describe in more detail below, this analysis of how CLECs enter local exchange markets, together with the economic definition of a relevant geographic market discussed

above, shows that the MSA is a readily-available geographic area that corresponds to the concept of the geographic market. In individual circumstances, media geographic contours may not align perfectly with MSA boundaries, and switches can certainly serve larger areas than individual MSAs. Circumstances of individual CLECs may favor entry into different geographic areas: *e.g.*. cable companies may initially serve telephone customers in part or all of their cable footprint, or some CLECs may offer service in contiguous areas in a neighboring MSA. Nonetheless, because the MSA approximates how mass-market services are sold (through mass-market advertising) and how services are provided (with a switch that serves a large geographic area), the MSA is the appropriate generic answer to the question: in what geographic areas are CLEC and ILEC services likely to compete.

Q. WHAT ARE METROPOLITAN STATISTICAL AREAS?

A. In concept, a MSA is a county or group of counties having a large clustered population, including adjacent areas having a high degree of community of interest with the core population center. Specifically, the Office of Management and Budget (OMB) defines MSAs as a county or group of counties with (1) a city of population 50,000 or more or (2) an urbanized area (as defined by the Census Bureau) of population of at least 50,000 consisting of one or more counties.[9] According to the OMB:

> The general concept of a Metropolitan Statistical Area or a Micropolitan Statistical Area is that of an area containing a recognized population

[9] The OMB defines a conceptually similar set of areas in New England using cities and towns as geographic building blocks, referred to as New England city and town areas (NECTAs)

> nucleus and adjacent communities that have a high degree of integration with that nucleus.
>
> Metropolitan Statistical Area.—A Core Based Statistical Area associated with at least one urbanized area that has a population of at least 50,000. The Metropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting.[10]

Specifically, MSAs are carefully developed to reflect demographic and commercial reality based on the application of OMB standards to census data (including commuting patterns). MSAs have a "high degree of integration" with a recognized population nucleus and recognize "economic linkages between urban cores and outlying, integrated areas."[11]

Q. WHY DO THESE AREAS DETERMINE REASONABLE BOUNDARIES FOR THE GEOGRAPHIC SCOPE OF LOCAL EXCHANGE MARKETS?

A. In general, we would expect carriers to try to serve at least the MSA because the high degree of social and economic integration present in such areas implies that firms would generally market services throughout this geographic area.[12] Mass-market entry is associated with media advertising aimed at a geographic area at least as large as the MSA; thus, we would expect the carrier to serve the entire MSA because advertising

[10] Currently defined metropolitan and micropolitan statistical areas are based on application of the 2000 standards (which appeared in the Federal Register on December 27, 2000) to Census 2000 data and were announced by OMB effective June 6, 2003.

[11] 65 Fed. Reg. 82228 (2000).

[12] While these incentives clearly apply to new entrants, there may be circumstances where a CLEC's existing facilities or customer base may dictate serving, at least initially, a geographic area different from an MSA. Examples might include cable companies that choose to provide telephone service to part or all of their video footprint or CLECs that expand across an MSA boundary into an area contiguous with their existing facilities.

throughout the MSA but not serving the entire area raises costs and harms the carrier's reputation. Service offerings, including offerings of discounted bundled services, are frequently rolled out by individual MSA since that is the geographic area covered by newspapers and local radio, television and cable media.[13] Thus, all potential customers in the MSA are exposed to the same mass-market advertising messages.

By the same token, entry into local exchange markets from outside the MSA (*e.g.*, in response to a price increase) is certainly possible, but may be more difficult because potential new entrants have no existing customer base and little brand awareness, except that engendered by the provision of other related services (e.g., AT&T or MCI's long distance services) or by national marketing plans (e.g., MCI's The Neighborhood). Furthermore, potential customers served by ILEC central offices too small or too sparsely populated to justify the CLEC's cost of collocation or backhaul transport to the switch are still exposed to the same marketing messages and can be served through resale of the ILEC's retail local exchange service.

In this sense, mass-market consumers in any two central offices in the same MSA generally face similar competitive conditions and have access to similar competitive alternatives. In addition, as Mr. Fleming explains (and the FCC observed in its Pricing Flexibility Order [at ¶ 72]), the MSA reflects the primary geographic scope of

---

However, of all the existing, pre-defined geographic areas, the MSA comes closest to encompassing the area in which local exchange competition takes place.

[13] In fact, in its discussion of the metropolitan area to be used in the Bell Atlantic/NYNEX merger, the FCC observed that television and radio advertising markets generally encompassed the geographic area it had designated. *Bell Atlantic-NYNEX Order* at ¶ 55-56.

competitive entry from the CLEC's perspective, because the entry decision is generally undertaken first at the level of the MSA. Consistent with the geographic market definitions favored by recent FCC decisions (discussed below) and the geographic market analysis generally used in the antitrust and economic context, such customers are thus part of the same geographic market.

D. Previous FCC Determination of Geographic Markets

Q. HAS THE FCC PREVIOUSLY DETERMINED THAT METROPOLITAN AREAS ARE THE CORRECT GEOGRAPHIC SCOPE OF LOCAL EXCHANGE MARKETS?

A. Yes, in at least three contexts. First, in its just-released order that allows customers to port their wireline telephone numbers to wireless carriers, the FCC implemented this requirement on a MSA basis.[14] This order is especially germane to this proceeding, because, as four of the five FCC Commissioners explicitly observed in their separate statements, one of the major implications of the order is to substantially increase the intermodal competition between wireline services (including ILEC offerings) and wireless services.

Second, in its assessment of how the merger of formerly independent incumbent local exchange carriers would affect local exchange competition in the merged territories, the FCC identified specific metropolitan areas as the markets subject to a competitive

[14] *In the Matter of Telephone Number Portability and CTIA Petitions for Declaratory Ruling on Wireline-Wireless Porting Issues* (CC Docket No. 95-116) Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, FCC 03-284 (released November 10, 2003) at ¶ 29-30.

assessment.[15] Consistent with my previous discussion and the testimony of Mr. Fleming on how CLECs have promoted their offerings in Missouri, the FCC identified the metropolitan scope of advertising markets as a relevant factor in defining the market.[16]

Third, in its order granting ILECs price flexibility for certain interstate services, the FCC concluded:

> We will grant pricing flexibility relief for both Phase I and Phase II on an MSA basis. We agree with those commenters that maintain that MSAs best reflect the scope of competitive entry, and therefore are a logical basis for measuring the extent of competition.[17]

As I describe in more detail below, when properly interpreted, the FCC's market definition rule in its TRO order is entirely consistent with its prior emphasis on the "scope of competitive entry" used to define geographic markets in its price flexibility order.

In addition to defining geographic markets for local competition, the FCC has used MSAs in numerous other proceedings, such as in its Biennial Review of spectrum aggregation limits for wireless carriers,[18] in defining the geographic markets for programming distributors[19] and in conducting lotteries and granting the right to acquire

[15] See, for example, *Bell Atlantic-NYNEX Order* at ¶ 43.

[16] *Ibid.* at ¶ 55.

[17] *Pricing Flexibility Order* at ¶ 72.

[18] *In re 1998 Biennial Regulatory Review Spectrum Aggregation Limits for Wireless Telecommunications Carriers*, 15 FCC Rcd. 22072 at ¶16 (October 17, 2000).

[19] *In re Implementation of Section 304 of the Telecommunications Act of 1996*, 13 FCC Rcd. 14775 at ¶ 108 (June 11, 1998).

cellular telephone licenses.[20] It also used the MSA as the geographic basis for its switching exemption for CLECs serving high-volume (4-plus line) customers.[21]

III. APPLICATION OF THE TRO'S MARKET DEFINITION RULE

A. Properly Interpreted, the FCC's Rule Supports the Use of MSAs as Geographic Markets

Q. WHAT IS THE FCC'S RULE FOR DETERMINING THE GEOGRAPHIC SCOPE OF THE MARKET?

A. The FCC's market-definition rule specifies that

> A state commission shall define the markets in which it will evaluate impairment by determining the relevant geographic area to include in each market. In defining markets, a state commission shall take into consideration the locations of mass market customers actually being served (if any) by competitors, the variation in factors affecting competitors' ability to serve each group of customers, and competitors' ability to target and serve specific markets profitably and efficiently using currently available technologies. A state commission shall not define the relevant geographic area as the entire state.[22]

Paragraphs 495-496 of the TRO refer to specific factors that a state commission may choose to consider in defining the geographic market. All in all, however, the most significant factor is where CLECs have chosen to enter and compete for mass-market

[20] The Federal Trade Commission has also noted that MSAs can serve as "close proxies" for detailed geographic analysis and has frequently used MSAs to define geographic markets in the number of cases involving retail sales to consumers. *See In the Matter of CVS Corporation*, File No. 971-0060, Analysis to Proposed Consent Order to Aid Public Comment (June 1997).

[21] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, 15 FCC Rcd 3696, 3699, *("UNE Remand Order")*, ¶¶ 276-298. Specifically, ILECs are exempted from having to provide unbundled switching to CLECs serving customers with four or more lines in density zone one of the top 50 MSAs.

[22] 47 CFR § 51.319(d)(2)(i)

customers through their own switches and the areas that they do serve and could serve via those switches. The FCC places heavy emphasis on actual marketplace evidence throughout the TRO. At paragraph 93, for example, the FCC states, "As we anticipated in the *Triennial Review NPRM,* we agree with commentators that argue that actual marketplace evidence is the most persuasive and useful kind of evidence submitted. In particular, we are most interested in granular evidence that new entrants are providing retail services in the relevant market using non-incumbent LEC facilities . . ." The market-entry evidence presented by Mr. Fleming implicitly reflects the CLECs' own economic and business evaluation of all the other potentially relevant factors listed in paragraphs 495-96.

Q. IS THE PRIMACY THAT THE TRO GIVES TO ACTUAL MASS-MARKET CUSTOMER LOCATIONS SENSIBLE FROM AN ECONOMIC PERSPECTIVE?

A. Yes. These locations are the outcome of business decisions that very likely required real entrants to consider some or all (and perhaps even more) of the various factors contained in the list suggested in the TRO. Indeed, in its instructions on how states should analyze potential competition, the TRO notes that: "the existence of a competitor serving the mass market with its own switch provides evidence that the mass market can be served effectively."[23] By the same token, the locations of customers actually being served provide substantial evidence that these locations are part of the area that a CLEC's scale and scope economies would allow it to serve economically. Therefore, the geographic areas in which CLECs actually serve mass-market customers using their own switching

[23] TRO at ¶ 510.

facilities are—at least—areas in which CLECs would not be impaired by the absence of unbundled switching. The actual mass-market customers served by the CLECs' switches are spread throughout most of SBC's territory within Missouri's major MSAs: St. Louis, Springfield, and Kansas City. In particular, in the these MSAs, CLECs have entered and serve with their own switches mass-market customers located in wire centers that account for about 76 percent of SBC Missouri's lines in these MSAs, indicating that CLECs do indeed enter and serve customers throughout these markets, which they would not do if it were uneconomic.[24] In particular, the fact that competitors have established a presence in such a large proportion of SBC Missouri's territory demonstrates that "competitors' ability to use self-provisioned switches…to serve various groups of customers"[25] is not substantially limited within the major MSAs.

CLECs have a large presence in the major MSAs in Missouri. But equally important for determining the contours of the relevant geographic markets for conducting an impairment assessment is where CLECs have not chosen to serve customers using their own switches. Like Sherlock Holmes' dog that didn't bark, CLECs have not entered and do not yet serve large groups of mass-market customers in SBC wire centers located outside of these major MSAs. Of the 19 MSAs and Micropolitan Statistical Areas that overlap SBC Missouri's service territory, CLECs have no presence in and provide no

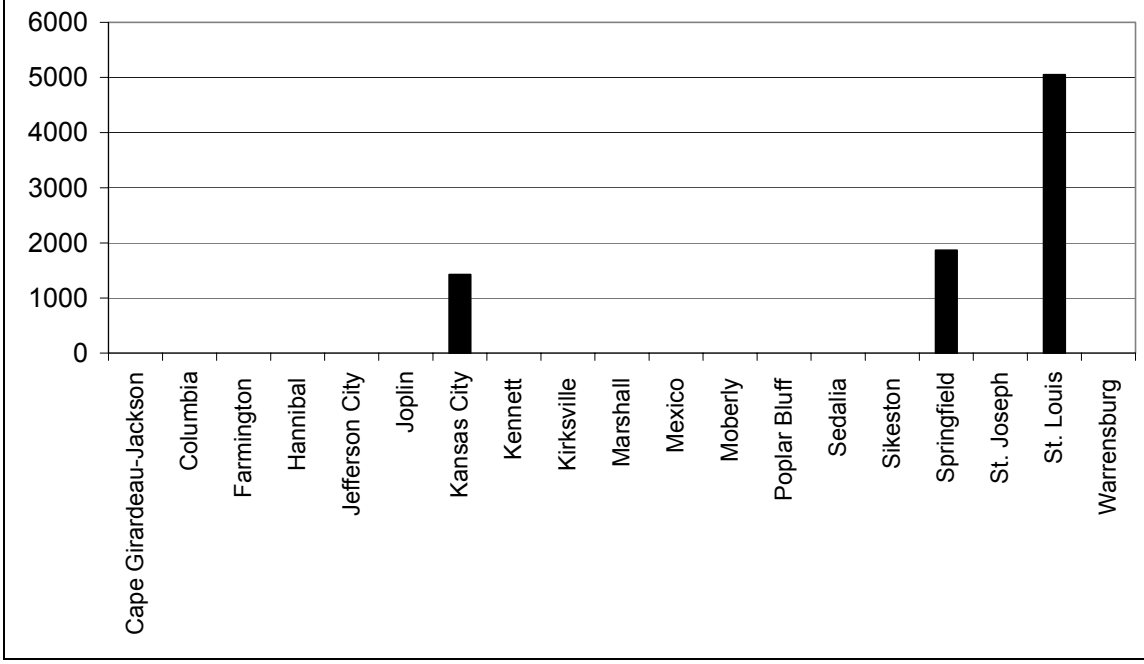
[24] Using data from Mr. Fleming's testimony and additional SBC data, I identify those wire centers in the MSAs in which CLECs provide UNE-L service to mass-market customers. The ratio of SBC access lines in those wire centers to total SBC access lines in the MSAs is approximately 76 percent. The data and analyses described in Mr. Fleming's testimony provide further support that CLECs enter and compete within markets reasonably delineated by MSAs.

[25] TRO at ¶ 495.

mass market UNE-L services in 16. In the remaining three MSAs, CLECs have entered and are providing mass-market services using their own switching facilities. See Figure 1.

The FCC stated, "if competitors with their own switches are only serving certain geographic areas, the state commission should consider establishing those areas to constitute separate markets."[26] Here, CLECs with their own switches are primarily serving the major MSAs, which thus constitutes their own market, using the FCC's criteria.

FIGURE 1
CLEC Mass Market UNE-L Lines in Missouri MSAs



[26] TRO, ¶ 495 n.1537.

Q. WHY IS IT IMPORTANT TO CONSIDER WHERE CLECS HAVE NOT CHOSEN TO SERVE?

A. Limited or no entry by CLECs deploying their own switches into certain MSAs in contrast with the major MSAs corroborates that once CLECs decide to enter at all, they are indeed entering the marketplace at the MSA level. As the FCC put it in paragraph 495 of the TRO, the Commission should, when it determines geographic market definitions, "attempt to distinguish among markets where different findings of impairment are likely." In view of the extensive CLEC entry into the major MSAs, a finding of non-impairment in those MSAs is very likely. It is much less likely elsewhere, where the level of CLEC entry is limited to date.

Q. DOES IT MATTER THAT IN SOME WIRE CENTERS CLECS MAY BE USING THEIR SWITCHES TO SERVE "ENTERPRISE" CUSTOMERS RATHER THAN MASS-MARKET CUSTOMERS?

A. No. Some ILEC wire centers may serve predominantly enterprise business customers, and it would not be surprising to find CLECs using their switches to compete predominantly for those customers. What matters for determining the scope of the geographic market in which CLECs and ILECs compete is that CLECs have already incurred the fixed costs (switch location) necessary to offer mass-market services in these wire centers so that CLECs *can* serve mass-market customers—if they choose to —in those wire centers.

Q. HAVE YOU CONSIDERED THE SPECIFIC FACTORS SUGGESTED IN THE TRO?

A. Yes. Paragraphs 495-96 of the *TRO* permit a state commission to elect to consider (i) "how competitors' ability to use self-provisioned switches or switches provided by a

third-party wholesaler to serve various groups of customers varies geographically"; (ii) "how UNE loop rates vary across the state"; (iii) how retail rates vary geographically"; (iv) how the cost of serving customers varies according to the size of the wire center and the location of the wire center"; and (v) "variations in the capabilities of wire centers to provide adequate collocation space and handle large numbers of hot cuts."

It is important to note that none of these additional factors is mandatory, and for good reason. Where, as here, the evidence regarding the scale and scope of actual CLEC entry and use of their own switches to serve mass-market customers in a given market (here, the major MSAs), is so strong, there is no need to examine other factors. The CLECs' own conduct proves the geographic market to be the MSA. In this case, the enumerated factors would be redundant: they are fundamentally determinants of the potential profitability (revenue minus cost) of serving particular parts of an overall geographic market,[27] and, CLECs' conduct implies that entry into the MSA is perceived as potentially profitable.

As I explained earlier, CLECs are already serving mass-market customer locations in wire centers that account for substantial proportions of SBC Missouri's access lines in the major MSAs and the wire centers from which CLECs are using mass market UNE loops include each of the four UNE loop rate zones. And even the wire centers with the highest

[27] Potential profitability depends on likely revenues and costs. As Mr. Fleming describes in greater detail, on the revenue side, retail prices vary over several rate groups and subgroups. On the cost side, UNE loop rates also vary by rate zone. However, in the three MSAs in which CLECs have entered with their own switches, the large bulk of access lines are in wire centers that have a combination of being in a high retail rate group and a low UNE loop rate zone.

UNE loop rates (Zone 3) contain mass-market customers served by CLEC switches: mass-market customers are served by CLEC switches in wire centers that contain over 63 percent of SBC Missouri's lines in these wire centers.[28] Consequently, the combination of UNE loop rates and other costs does not appear to restrict the geographic scope of markets to any great extent, and certainly does not justify the use of geographic markets smaller than an MSA

Q. DOES THE FACT THAT CLECS DO NOT PRESENTLY SERVE WITH THEIR OWN SWITCHES MASS-MARKET CUSTOMERS IN EVERY WIRE CENTER IMPLY THAT THE GEOGRAPHIC SCOPE OF A MARKET SHOULD BE SMALLER THAN THE MSA?

A. No. As I indicated earlier, a relevant geographic market for purposes of competitive analysis includes not only where competitors currently serve customers, but also where they readily could serve customers if the incumbent were to raise prices. The geographic coverage of CLEC switches, the geographic coverage of radio, television and print media, and the existence of collocation throughout the MSA, as well as the CLEC-owned NXX codes, show that CLECs could easily expand into other areas in the MSA (and likely will do so even if SBC Missouri's retail prices remain the same).

Further, because CLECs are free to target their customers, they can choose to serve only the most lucrative customers and/or locations, at least initially. Indeed, to the extent that CLECs may view serving such areas as uneconomic, the most likely cause is not the cost of providing service, but the low regulated retail rates for basic services that SBC

[28] Using data from Mr. Fleming's testimony and additional SBC data, I identified the UNE Zone 3 wire centers in the major MSAs in which CLECs serve mass-market customers with their own switch. The ratio of total SBC access lines in those wire centers to total SBC access lines in the threes MSA is 63 percent.

Missouri currently charges.[29] This would suggest that they are comparably difficult for SBC Missouri to serve profitably as well but would not imply any "impairment" of the kind contemplated by the 1996 Act. Further, unlike SBC Missouri, which continues to serve all areas in its territory with its own facilities despite any uneconomic retail prices for basic services that may prevail, CLECs can choose to have a ubiquitous presence using advantages provided to them by the Telecommunications Act that will continue regardless of whether mass-market switching continues to be a UNE in particular markets. In particular, where CLECs do not offer services completely over their own facilities and/or with UNE loops and their own switches, they could still serve customer locations using resale and/or UNE loops that CLECs could combine with local switching, which will remain available at just and reasonable (rather than TELRIC) prices.[30]

B. Areas Smaller than MSAs are Too Narrow to be Used as Geographic Markets

Q. DOES THE POSSIBILITY THAT THE COSTS OF SERVING CUSTOMERS MAY VARY BY WIRE CENTER SUPPORT A CONCLUSION THAT EACH WIRE CENTER IS A SEPARATE GEOGRAPHIC MARKET?

A. No. While it is certainly conceivable that costs could differ within different parts of the overall market, the fact that the variation in some cases may coincide with wire center

[29] In his statement attached to the TRO, FCC Chairman Michael Powell observed:

> Furthermore, it is widely accepted that because of universal service cross subsidies, many residential rates are priced below cost and, thus, the retail revenues associated with those services may, in some cases, not cover the costs incurred to provide the services. The D.C. Circuit, however, rejected the notion that competitors' decision not to enter subsidized markets with their own facilities demonstrates impairment. [Separate Statement of Michael K. Powell, pp. 14-15]

[30] TRO at ¶ 656.

areas has no particular significance. Indeed, costs often vary within more traditional geographic markets (e.g., because of differences in transporting goods).[31] What matters for the economic definition of a geographic market is whether prices and services in one area are constrained by prices and services in another.

Of even greater significance is the fact that using wire centers[32] as geographic "markets" is entirely inconsistent with both how competitors enter and compete for customers and the specific directives the TRO has established for determining the geographic scope of markets. In particular, the TRO's primary considerations of "the locations of customers actually being served by competitors" and "not defin[ing] the market so narrowly that a competitor serving that market alone would not be able to take advantage of available scale and scope economies"[33] renders wire center "markets" much too narrow and consequently unreasonable. From an implementation viewpoint, in its *Pricing Flexibility Order*, the FCC rejected the use of wire center areas for the geographic scope of a market, partly on the grounds of administrative cost (¶ 74) and instead concluded that "MSAs best reflect the scope of competitive entry" (¶ 72).

In particular, Mr. Fleming's testimony demonstrates that competitors' switches serve mass-market customers in multiple wire centers, because to do so allows them to take

[31] For example, in illustrating their geographic market definition presented earlier in this testimony, Carlton and Perloff use the example of oranges shipped to an urban area. Clearly, the prices would reflect the costs of shipping the product.

[32] The reasons why it would be incorrect to consider discrete parts of the proper geographic market (i.e., the MSA) as markets in their own right apply not only to wire centers, but also to any subdivision of an MSA, e.g., counties and/or individual cities.

[33] TRO at ¶ 495.

advantage of the scale and scope economies available from deploying their switches. Conversely, the FCC's suggestion that the existence of possibly "uneconomical" pockets in a larger area (e.g., a LATA) may call for smaller geographic markets[34] would be incorrect if the entirety of the end-use customers for which ILECs and CLECs compete includes those areas.[35]

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Because there has been significant entry by CLECs that use their own switches to serve mass-market local exchange customers, available data permits the Commission readily to "take into consideration the locations of mass-market customers actually being served by competitors." Consistent with previous FCC determinations, the information presented by Mr. Fleming shows that CLECs in Missouri enter and promote their services on a MSA basis, thus revealing "their ability to target and serve specific markets profitably and efficiently using currently available technologies." Similarly, the result that CLECs have wide coverage throughout the MSAs into which they have entered demonstrates that "variation in factors affecting competitors' ability to serve each group of customers" does not limit CLECs only to minor parts of these MSAs.

Based on economic reasoning, the requirements of the TRO, and the data (presented in Mr. Fleming's testimony) on how CLECs have entered local exchange markets in

[34] See, for example, TRO at ¶ 495.

[35] For example, footnote 1537 suggests that states could define the market for analyzing local switch impairment as being the geography over which competitors are actually serving customers. The fact that a CLEC chooses to serve some customers with resale or UNE-P and others with its own switch should not be used to incorrectly exclude some customers from the relevant geographic market.

Missouri, I conclude that MSAs are the appropriate geographic areas to be used in mass-market switching impairment analyses.

Q. DOES THIS COMPLETE YOUR TESTIMONY?

A. Yes.

TIMOTHY J. TARDIFF

BUSINESS ADDRESS

National Economic Research Associates, Inc.
One Main Street
Cambridge, Massachusetts 02142
(617) 621-0444

Dr. Tardiff received a B.S. with honors in Mathematics from the California Institute of Technology in Pasadena and a Ph.D. degree in Social Science from the University of California, Irvine, under a National Science Foundation Pre-doctoral Fellowship and an NSF Grant for Improving Dissertation Research in the Social Sciences.

Dr. Tardiff joined the faculties of the Department of Civil Engineering and the Division of Environmental Studies at the University of California, Davis. He taught undergraduate and graduate level courses in transportation and environmental policy analysis. His research included applications of econometric models of consumer choice to transportation planning problems. Dr. Tardiff's research was funded by the National Science Foundation, the Institute of Transportation Studies and the California Department of Transportation.

Prior to joining NERA, Dr. Tardiff's work included transportation, energy, public utility and telephone industry projects for the U.S. Departments of Transportation and Energy, the California Energy Commission, and several telephone and electric utilities.

Since joining NERA, he has evaluated pricing policies for increasingly competitive telecommunications markets, including appropriate mechanisms for pricing access services to competitors; studied actual and potential competition for services provided by telephone operating companies; analyzed the demand and revenue impacts of new telephone rate structures; developed and evaluated damage studies used in major telecommunications antitrust actions; analyzed the demand for wireless telephony; evaluated the investment and marketing programs of telephone companies; and developed a demand model for analyzing the market potential for alternative employee health care plans, including health maintenance organizations. Dr. Tardiff's international research and consulting experience includes studies of the Japanese long-distance industry, consultation on competitive policies for the Canadian local exchange industry, and participation in interconnection and universal service proceedings pursuant to New Zealand's 2001 Telecommunication Act.

Dr. Tardiff has published extensively in the transportation literature. He has presented and published papers on the telecommunications industry. These papers address the issues of pricing and costing policies for emerging competition in telecommunications markets; evaluating

and forecasting the impacts of telephone rate plans such as local measured service; analyzing the markets for new telecommunications products and services; and local competition policy issues.

EDUCATION

UNIVERSITY OF CALIFORNIA, IRVINE
Ph.D., Social Sciences, 1974

CALIFORNIA INSTITUTE OF TECHNOLOGY
B.S., Mathematics, 1971

EMPLOYMENT

NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC.

1992 Vice President. Works on cases, mainly legal and regulatory, on issues of pricing policy, assessing demand for new and existing products and services, and economic damages. This work involves studies, often involving econometric demand analysis methods, for telecommunications, utilities and other clients. Specific areas have included: assessment of competition in the telecommunications industry; analysis of alternative approaches for regulating telephone utilities; evaluation of the benefits from telecommunication products and services; analyzing the demand for local services, toll, and carrier access; evaluation of the prudence of telephone company investments; damage studies for telecommunications antitrust cases; evaluation of methods for environmental damage assessment; and analysis of energy conservation /programs.

1984-1992 Senior Consultant

CHARLES RIVER ASSOCIATES, INC.--Boston, Massachusetts

1979-1984 Director of Marketing Research. Managed program to apply econometric customer demand models to marketing research problems in telecommunications, electric utilities, transportation and other industries.

Senior Research Associate. Performed studies on urban transportation, freight transportation, energy and telecommunications issues.

UNIVERSITY OF CALIFORNIA, DAVIS--Davis, California

1974-1979 Assistant Professor, Department of Civil Engineering and Division of Environmental Studies. Taught undergraduate and graduate course in transportation and environmental policy and quantitative research methods;

conducted research on passenger transportation demand, (including econometric issues).

FELLOWSHIPS, GRANTS, AWARDS

First Place, Dissertation Contest of the Transportation Science Section of the Operations Research Society of America.

NSF Research Initiation Grant (Engineering Division), 1976-1978.

NSF Grant for Improving Doctoral Dissertation Research in the Social Sciences, 1973-1974.

NSF Predoctoral Fellowship, 1972-1974.

Public Health Service Traineeship, 1971-1972.

AFFILIATIONS

American Economic Association

TESTIMONY

Declaration of Alfred E. Kahn and Timothy Tardiff on the review of rules for pricing unbundled network elements, prepared for filing with the Federal Communications Commission on behalf of Verizon, WC Docket No. 03-173, December 16, 2003.

Direct Testimony of Timothy J. Tardiff concerning geographic market definition, prepared for filing with the California Public Utilities Commission on behalf of SBC California, Rulemaking 95-04-043, Investigation 95-04-044, December 12, 2003.

Direct Testimony of Timothy J. Tardiff concerning geographic market definition, prepared for filing with the Public Utilities Commission of Ohio on behalf of SBC Ohio, Case No. 03-2040-TP-COI, November 12, 2003.

Statement of Timothy J. Tardiff on the Commission's Telecommunications Service Obligation (TSO) Model, prepared for filing with the New Zealand Commerce Commission on behalf of Telecom Corporation of New Zealand, May 20, 2003.

Rebuttal Declaration of Timothy J. Tardiff on the use of the HAI, Release 5.3 Model for unbundled network elements costs, prepared for filing with the California Public Utilities Commission on behalf of SBC California, Application Nos. 01-02-024, 01-02-035, 02-02-031, 02-02-032, and 02-03-002, March 12, 2003.

Reply Declaration of Timothy J. Tardiff on the use of the HAI, Release 5.3 Model for unbundled network elements costs, prepared for filing with the California Public Utilities Commission on behalf of SBC California, Application Nos. 01-02-024, 01-02-035, 02-02-031, 02-02-032, and 02-03-002, February 7, 2003.

Affidavit of Timothy J. Tardiff on the use of the FCC's Synthesis Model to calculate unbundled network switching and transport prices, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket No. U-96-89, December 18, 2002.

Declaration of Timothy J. Tardiff in support of the Petition of Verizon for Forbearance From The Prohibition Of Sharing Operating, Installation, and Maintenance Functions Under Section 53.203(a)(2) Of The Commission's Rules, CC Docket No. 96-149, September 24, 2002.

Affidavit of Timothy J. Tardiff on unbundled network element pricing, prepared for filing with the Federal Communications Commission on behalf of ACS, WC Docket No. 02-201, July 24, 2002.

Reply Declaration of Alfred E. Kahn and Timothy J. Tardiff in the triennial review of unbundled network elements, prepared for filing with the Federal Communications Commission on behalf of Verizon, CC Docket Nos. 01-338, 96-98, and 98-147, July 17, 2002.

Statement of Alfred E. Kahn and Timothy J. Tardiff on funding the telecommunications service (universal service) obligation, prepared for filing with the New Zealand Commerce Commission on behalf of Telecom Corporation of New Zealand, June 10, 2002.

Supplemental Surrebuttal Testimony of Timothy Tardiff and Francis Murphy on the use of the FCC's Synthesis Model for evaluating the costs of unbundled network elements, prepared for filing with the Florida Public Service Commission on behalf of Verizon-Florida, Docket No. 990649B-TP, April 22, 2002.

Surrebuttal Testimony of Timothy Tardiff and Francis Murphy on the use of the FCC's Synthesis Model for evaluating the costs of unbundled network elements, prepared for filing with the Florida Public Service Commission on behalf of Verizon-Florida, Docket No. 990649B-TP, March 18, 2002.

Surrebuttal Testimony of Howard Shelanski and Timothy Tardiff on economic principles for determining the costs of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Verizon-Pennsylvania, Docket No. R-00016683, February 8, 2002.

Rebuttal Testimony of Timothy J. Tardiff and Joseph A. Gansert on the application of the Modified Synthesis Model for the costs of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Verizon-Pennsylvania, Docket No. R-00016683, February 8, 2002.

Rebuttal Testimony of Howard Shelanski and Timothy Tardiff on economic principles for determining the costs of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Verizon-Pennsylvania, Docket No. R-00016683, January 11, 2002.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Modified Synthesis Model for the costs of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Verizon-Pennsylvania, Docket No. R-00016683, January 11, 2002.

Supplemental Rebuttal Testimony of Timothy J. Tardiff on the application of the Modified Synthesis Model for the costs of unbundled network elements, prepared for filing with the Federal Communications Commission on behalf of Verizon-Virginia, CC Docket Nos. 00-218, 00-249, and 00-251, November 16, 2001.

Declaration of Timothy J. Tardiff on the use of the HAI, Release 5.2a for deriving an unbundled switch cost reduction, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, October 30, 2001.

Declaration of Timothy J. Tardiff on the use of the HAI, Release 5.2a for deriving an unbundled loop cost reduction, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, October 19, 2001.

Surrebuttal Testimony of Howard Shelanski and Timothy J. Tardiff on economic principles for determining the costs of unbundled network elements, prepared for filing with the Federal Communications Commission on behalf of Verizon-Virginia, CC Docket Nos. 00-218, 00-249, and 00-251, September 21, 2001.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Modified Synthesis Model for the costs of unbundled network elements, prepared for filing with the Maryland Public Service Commission on behalf of Verizon-Maryland, Case No. 8879, September 5, 2001.

Declaration of Timothy J. Tardiff on the use of the HAI, Release 5.2a and Modified Synthesis Models for unbundled loop and switch costs, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 4, 2001.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Modified Synthesis Model for the costs of unbundled network elements, prepared for filing with the Federal Communications Commission on behalf of Verizon-Virginia, CC Docket Nos. 00-218, 00-249, and 00-251, August 27, 2001.

Affidavit of Timothy J. Tardiff on the use of proxy costs models for unbundled network elements, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket No. U-96-89, July 27, 2001.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Hatfield Model for the costs of unbundled network elements, prepared for filing with the Massachusetts Department of Telecommunications and Energy on behalf of Verizon-Massachusetts, Docket No. D.T.E. 01-20, July 18, 2001.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Hatfield Model for the costs of unbundled network elements, prepared for filing with the New Jersey Board of Public Utilities on behalf of Verizon-New Jersey, Docket No. TO00060356, October 12, 2000.

Supplemental Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the State of Maine Public Utilities Commission on behalf of Bell Atlantic-Maine, Case No. 97-505, October 10, 2000.

Public Interest Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc. Nevada Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Nevada Bell Long Distance for Provision of In-Region InterLATA Services in Nevada (with Alfred E. Kahn), July 24, 2000.

Responsive Testimony on the HAI Model of unbundled network elements, prepared for filing with the New York Public Service Commission on behalf of Bell Atlantic-New York, Case 98-C-1357 (filed as part of panel testimony), June 26, 2000.

Affidavit of Timothy J. Tardiff on avoided cost discounts for wholesale services, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket Nos. U-99-141, U-99-142 and U-99-143, April 17, 2000.

Third Affidavit of Timothy J. Tardiff on costs models for unbundled network elements, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket Nos. U-99-141, U-99-142 and U-99-143, March 24, 2000.

Second Affidavit of Timothy J. Tardiff on costs models for unbundled network elements, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket Nos. U-99-141, U-99-142 and U-99-143, February 25, 2000.

Rebuttal Testimony of Timothy J. Tardiff on collocation costs models, prepared for filing with the Delaware Public Service Commission on behalf of Bell Atlantic-Delaware, Docket No. 99-251, February 24, 2000.

Affidavit of Timothy J. Tardiff on costs models for unbundled network elements, prepared for filing with the Regulatory Commission of Alaska, on behalf of Alaska Communications Systems, Docket Nos. U-99-141, U-99-142 and U-99-143, February 11, 2000.

Public Interest Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc. Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance for Provision of In-Region InterLATA Services in Texas (with Alfred E. Kahn), January 10, 2000.

Rebuttal Testimony of Timothy J. Tardiff on collocation costs models, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Bell Atlantic-Pennsylvania, Docket Nos. R-00994697 and R-00994697C0001, December 21, 1999.

"Relaxed Regulation of High Capacity Services in Phoenix and Seattle: The Time is Now," prepared for filing with the Federal Communications Commission on behalf of US WEST Communications, Petitions of US WEST Communications for

Forbearance from Regulation as a Dominant Carrier in the Phoenix and Seattle MSAs (with Alfred E. Kahn), July 21, 1999.

Rebuttal Testimony of Timothy J. Tardiff on the HAI Model of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Bell Atlantic-Pennsylvania, Docket Nos. P-00991648 and P-00991649, June 15, 1999.

"High Capacity Competition in Seattle: Reply to Comments of Intervening Parties," prepared for filing with the Federal Communications Commission on behalf of US WEST Communications, Petition of US WEST Communications for Forbearance from Regulation as a Dominant Carrier in the Seattle, Washington MSA (with Alfred E. Kahn), March 10, 1999.

Rebuttal Testimony of Timothy J. Tardiff on collocation costs models, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, February 8, 1999.

Surrebuttal Testimony of Alfred E. Kahn and Timothy J. Tardiff, filed with the Missouri Public Service Commission, in support of the Applications of SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Provision of In-Region InterLATA Services in Missouri, Docket No. TO 99-227, February 4, 1999.

Rebuttal Testimony of Timothy J. Tardiff on the HAI Model of unbundled network elements, prepared for filing with the Rhode Island Public Utilities Commission on behalf of Bell Atlantic-Rhode Island, Docket No. 2681, January 15, 1999.

Reply Testimony of Timothy J. Tardiff on collocation costs models, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, January 11, 1999.

"Economic Evaluation of High Capacity Competition in Seattle," prepared for filing with the Federal Communications Commission on behalf of US WEST Communications, Petition of US WEST Communications for Forbearance from Regulation as a Dominant Carrier in the Seattle, Washington MSA (with Alfred E. Kahn), December 22, 1998.

Testimony of Timothy J. Tardiff on collocation costs models, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, December 18, 1998.

"Measuring and Recovering the Costs of Long-Term Number Portability: Implications of Price Cap Regulation," Prepared for Southwestern Bell for presentation to the Federal Communications Commission, December 10, 1998.

Direct Testimony of Alfred E. Kahn and Timothy J. Tardiff, filed with the Missouri Public Service Commission, in support of the Applications of SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Provision of In-Region InterLATA Services in Missouri, Docket No. TO 99-227, November 20, 1998.

"High Capacity Competition in Phoenix: Reply to Comments of Intervening Parties," prepared for filing with the Federal Communications Commission on behalf of US WEST Communications, Petition of US WEST Communications for Forbearance from Regulation as a Dominant Carrier in the Phoenix, Arizona MSA (with Alfred E. Kahn), October 28, 1998.

"Measuring and Recovering the Costs of Long-Term Number Portability," Prepared for Southwestern Bell for presentation to the Federal Communications Commission, October 28, 1998 (with Alfred E. Kahn).

Declaration of Timothy J. Tardiff on the economic impacts of separate subsidiary requirements for the offer of advanced services by incumbent local exchange carriers, prepared for filing with the Federal Communications Commission on behalf of Bell Atlantic, in the mater of Deployment of Wireline Services Offering Advanced Telecommunications Capability, October 15, 1998.

"An Analysis of the HAI Model Release 5.0a," Rebuttal Testimony filed with the Florida Public Service Commission, Docket No. 980696-TP, on behalf of GTE Florida, September 2, 1998 (with Gregory M. Duncan, Karyn E. Model, Christian M. Dippon, Jino W. Kim, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

"Economic Evaluation of High Capacity Competition in Phoenix," prepared for filing with the Federal Communications Commission on behalf of US WEST Communications, Petition of US WEST Communications for Forbearance from Regulation as a Dominant Carrier in the Phoenix, Arizona MSA (with Alfred E. Kahn), August 14, 1998.

Rebuttal Testimony of Timothy J. Tardiff on the HAI Model of unbundled network elements, prepared for filing with the New Hampshire Public Utilities Commission on behalf of Bell Atlantic-New Hampshire, Docket No. DE-97-1171, June 22, 1998.

Rebuttal Affidavit before the Arkansas Public Service Commission in the matter of the Application of Southwestern Bell Telephone Company Seeking Verification that It Has Fully Complied with and Satisfied the Requirements of Section 271 (c) of the Telecommunications Act of 1996, June 11, 1998.

Rebuttal Testimony before the State Corporation Commission of the State of Kansas in the matter of Southwestern Bell Telephone Company – Kansas' Compliance With Section 271 of the Federal Telecommunications Act of 1996, Docket No. 97-SWBT- 411-GIT (with Alfred E. Kahn), May 27, 1998.

Rebuttal Affidavit Before the Public Utilities Commission of the State of California in support of Pacific Bell's Draft Application for Authority to Provide InterLATA Services in California (with Alfred E. Kahn), May 20, 1998.

"An Analysis of the Hatfield Model Release 4.0," prepared for filing with the California Public Utilities Commission on behalf of GTE California, May 1, 1998 (with Gregory M. Duncan, Karyn E. Model, Christian M. Dippon, Jino W. Kim, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Reply Testimony of Timothy J. Tardiff on unbundled network element prices and retail service price floors, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, April 27, 1998.

Rebuttal Testimony of Alfred E. Kahn and Timothy J. Tardiff, filed with the Oklahoma Public Service Commission, in support of the Applications of SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Provision of In-Region InterLATA Services in Oklahoma, Case No. PUD 970000560, April 21, 1998.

Reply Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc. Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance for Provision of In-Region InterLATA Services in Texas (with Alfred E. Kahn), April 17, 1998.

Testimony of Timothy J. Tardiff on unbundled network element prices and retail service price floors, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, April 8, 1998.

Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc., Pacific Bell, and Pacific Bell Communications for Provision of In-Region InterLATA Services in California (with Alfred E. Kahn), March 31, 1998.

"Economic Principles Governing Measurement of Nonrecurring/OSS Costs: An Analysis of the AT&T/MCI Recommendations," prepared for filing with the California Public Utilities Commission on behalf of GTE California and Pacific Bell, March 4, 1998 (with Gregory M. Duncan).

"Analysis of the Hatfield Model Release 5.0a," Rebuttal Testimony filed with the North Carolina Utilities Commission, Docket No. P-100, Sub 133d, on behalf of GTE South, March 2, 1998 (with Gregory M. Duncan, Rafi A. Mohammed, Christian M. Dippon, Aniruddha Banerjee, Karyn E. Model, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

"Analysis of the Hatfield Model Release 5.0a," Rebuttal Testimony filed with the South Carolina Public Service Commission, on behalf of GTE South, March 2, 1998 (with Gregory M. Duncan, Rafi A. Mohammed, Christian M. Dippon, Aniruddha Banerjee, Karyn E. Model, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc. Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance for Provision of In-Region InterLATA Services in Texas (with Alfred E. Kahn), March 2, 1998.

"Analysis of the Hatfield Model Release 5.0a," Rebuttal Testimony filed with the Kentucky Public Service Commission, on behalf of GTE South, February 26, 1998 (with Gregory M. Duncan, Rafi A. Mohammed, Christian M. Dippon, Aniruddha Banerjee, Karyn E. Model, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications Inc. Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance for Provision of In-Region InterLATA Services in Arkansas (with Alfred E. Kahn), February 24, 1998.

Testimony before the State Corporation Commission of the State of Kansas in the matter of Southwestern Bell Telephone Company – Kansas' Compliance With Section 271 of the Federal Telecommunications Act of 1996, Docket No. 97-SWBT- 411-GIT (with Alfred E. Kahn), February 17, 1998.

"Analysis of the Hatfield Model Release 5.0," Rebuttal Testimony filed with the Alabama Public Utilities Commission, on behalf of GTE South, February 13, 1998

(with Gregory M. Duncan, Rafi A. Mohammed, Christian M. Dippon, Aniruddha Banerjee, Karyn E. Model, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Affidavit before the Federal Communications Commission in the matter of Application of SBC Communications. Inc. Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a/ Southwestern Bell Long Distance for Provision of In-Region InterLATA Services in Oklahoma (with Alfred E. Kahn), February 13, 1998.

"Analysis of the Hatfield Model Release 5.0," Rebuttal Testimony filed with the North Carolina Utilities Commission, Docket No. P-100, Sub 133b, on behalf of GTE South, January 30, 1998 (with Gregory M. Duncan, Rafi A. Mohammed, Christian M. Dippon, Aniruddha Banerjee, Karyn E. Model, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Supplemental Rebuttal Testimony of Timothy J. Tardiff on switching costs, prepared for filing with the State of Maine Public Utilities Commission on behalf of Bell Atlantic-Maine, Case No. 97-505, December 22, 1997.

"Reply to AT&T Recommendations for Regulatory Treatment of OSS Costs," prepared for filing with the California Public Utilities Commission on behalf of GTE California and Pacific Bell, December 15, 1997 (with Gregory M. Duncan).

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Vermont Public Service Board on behalf of Bell Atlantic-Vermont, Case No. 57-13, November 21, 1997.

Reply Affidavit of Timothy J. Tardiff on the Hatfield Model, filed with the New York Public Service Commission on behalf of Bell Atlantic-New York, Case 94-C-0095 and Case 28425, November 17, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the State of Maine Public Utilities Commission on behalf of Bell Atlantic-Maine, Case No. 97-505, October 21, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the application of the Hatfield Model to universal service funding requirements, prepared for filing with the New Jersey Board of Public Utilities on behalf of Bell Atlantic-New Jersey, Docket No. TX95120631, October 20, 1997.

"Analysis of the Hatfield Model Release 4.0," filed with the Pennsylvania Public Utility Commission on behalf of GTE North, October 20, 1997 (with Gregory M.

Duncan, Rafi A. Mohammed, Christian M. Dippon, Francis J. Murphy, Robert P. Cellupica, and Thomas F. Guarino).

Supplemental Rebuttal Testimony of Timothy J. Tardiff on toll and carrier access demand elasticities and universal service rate rebalancing, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, October 10, 1997.

Rebuttal Testimony of Timothy J. Tardiff on toll and carrier access demand elasticities and universal service rate rebalancing, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 30, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the State Corporation Commission of Virginia on behalf of Bell Atlantic-Virginia, Case No. PUC970005, June 10, 1997.

Reply Affidavit of Alfred E. Kahn and Timothy J. Tardiff, filed with the Federal Communications Commission, in support of the Applications of SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Provision of In-Region InterLATA Services in Oklahoma, May 26, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the District of Columbia Public Service Commission on behalf of Bell Atlantic-DC, Formal Case No. 962, May 2, 1997.

Declaration of Timothy J. Tardiff on OANAD Cost Studies, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, April 16, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Maryland Public Service Commission on behalf of Bell Atlantic-Maryland, Case No. 8731-II, April 4, 1997.

"Economic Evaluation of the Hatfield Model, Release 3.1," filed with the Washington Utilities and Transportation Commission on behalf of GTE, March 28, 1997 (with Gregory M. Duncan and Rafi Mohammed).

"Economic Evaluation of the Hatfield Model, Version 2.2, Release 2," prepared for filing with the California Public Utilities Commission on behalf of GTE California and Pacific Bell, March 18, 1997 (with Gregory M. Duncan).

Statement of Alfred E. Kahn and Timothy J. Tardiff, "Funding and Distributing the Universal Service Subsidy," Prepared for US West for presentation to the Federal Communications Commission, March 13, 1997.

Testimony of Timothy J. Tardiff on toll and carrier access demand elasticities, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, March 6, 1997.

Surrebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Pennsylvania Public Utility Commission on behalf of Bell Atlantic-Pennsylvania, Dockets A-310203F0002, A-310213F0002, A-310236F0002, A-310258F0002, February 21, 1997.

Affidavit of Alfred E. Kahn and Timothy J. Tardiff, filed with the Oklahoma Public Service Commission, in support of the Applications of SBC Communications, Inc., Southwestern Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Provision of In-Region InterLATA Services in Oklahoma, February 21, 1997.

"Reply to Kravtin/Selwyn Analysis of the Gap Between Embedded and Forward-Looking Costs," affidavit filed with the Federal Communications Commission, In the Matter of Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, on behalf of GTE, February 14, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Arkansas Public Service Commission on behalf of Southwestern Bell Telephone Company, Docket 96-395-U, January 9, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Kansas Corporation Commission on behalf of Southwestern Bell Telephone Company, Docket 97-AT&T-290-Arb, January 6, 1997.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Massachusetts Department of Public Utilities on behalf of New England Telephone and Telegraph Company, Docket 96-80/81, October 30, 1996.

Statement of Alfred E. Kahn and Timothy J. Tardiff, "Joint Marketing, Personnel Separation and Efficient Competition Under the Telecommunications Act of

1996," Prepared for US West for presentation to the Federal Communications Commission, October 11, 1996.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Oklahoma Public Service Commission on behalf of Southwestern Bell Telephone Company, September 30, 1996.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Missouri Public Service Commission on behalf of Southwestern Bell Telephone Company, Case No. TO-97-040 & TO 97-40-67, September 30, 1996.

"Economic Evaluation of Version 2.2 of the Hatfield Model," prepared for filing in interconnection arbitrations in Pennsylvania, California, Florida, Indiana, North Carolina, Oklahoma, Iowa, Texas, Virginia, Minnesota, Hawaii, Nebraska, Kentucky, Washington, and Missouri on behalf of GTE, September 1996 (with Gregory M. Duncan).

Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the Texas Public Utility Commission on behalf of Southwestern Bell Telephone Company, Docket Nos. 16189, 16196, 16226, 16285, 16290, September 6, 1996.

"Economic Analysis of MFS's Numerical Illustration," prepared for filing with the Federal Communications Commission, In the Matter of Implementation of the Non-Accounting Safeguards of Sections 271 and 272 of the Communications Act of 1934, as amended and Regulatory Treatment of LEC Provision of Interexchange Services Originating in the LEC's Local Exchange Area, on behalf of US West, August 30, 1996.

Affidavit of Timothy J. Tardiff on proxy rates for unbundled local switching, prepared for filing with the Federal Communications Commission on behalf of GTE Corporation, petition for a stay of the First Report and Order in the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, August 28, 1996.

Rebuttal Testimony of Timothy J. Tardiff on the Hatfield Model of unbundled network elements, prepared for filing with the New York Public Service Commission on behalf of New York Telephone, July 15, 1996

Reply Testimony of Timothy J. Tardiff on local exchange service price floors, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, July 10, 1996.

"Economic Evaluation of Version 2.2 of the Hatfield Model," attached to Reply Testimony of Timothy J. Tardiff , prepared for filing with the California Public Utilities Commission on behalf of GTE California, July 10, 1996. Also presented to the Federal Communications Commission as attachment to letter from Whitney Hatch of GTE to William F. Caton, In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, July 11, 1996.

Testimony of Timothy J. Tardiff on local exchange service price floors, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, June 14, 1996.

Declaration of Alfred E. Kahn and Timothy J. Tardiff, prepared for filing with the Federal Communications Commission, In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, on behalf of Bell Atlantic, May 30, 1996.

Declaration of Timothy J. Tardiff on Round I and Round II OANAD Cost Studies, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, May 24, 1996.

"Economic Evaluation of Pacific Bell's Round I and Round II Cost Studies: Reply Comments," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, April 17, 1996.

"Incremental Cost Principles for Local and Wireless Network Interconnection," prepared for filing with the Federal Communications Commission on behalf of Pacific Telesis, March 4, 1996 (with Richard D. Emmerson).

"Economic Evaluation of Selected Issues from the Fourth Further Notice of Proposed Rulemaking in the LEC Price Cap Performance Review: Reply Comments," Prepared for filing with the Federal Communications Commission on behalf of the United States Telephone Association, March 1, 1996 (with William E. Taylor and Charles J, Zarkadas).

Declaration of Timothy J. Tardiff on the toll and carrier access demand stimulation caused by the January 1, 1995 price reductions (update), prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, January 19, 1996.

"Universal Service Funding and Cost Modeling," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, January 19, 1996.

"Changes in Interstate Price Regulation: Reply Comments," prepared for filing with the Federal Communications Commission on behalf of Pacific Bell and Nevada Bell, January 10, 1996.

"Economic Evaluation of Selected Issues from the Fourth Further Notice of Proposed Rulemaking in the LEC Price Cap Performance Review," Prepared for filing with the Federal Communications Commission on behalf of the United States Telephone Association, December 18, 1995 (with William E. Taylor and Charles J, Zarkadas).

"Changes in Interstate Price Regulation: An Economic Evaluation of the Pacific Bell and Nevada Bell Proposal," prepared for filing with the Federal Communications Commission on behalf of Pacific Bell and Nevada Bell, December 11, 1995 (with Alfred E. Kahn).

"Evaluation of the Benchmark Cost Model," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, December 1, 1995.

Affidavit of William E. Taylor and Timothy J. Tardiff on interconnection regulation, prepared for filing with the Mexican Secretariat of Communications and Transport on behalf of Southwestern Bell International Holdings Corporation, October 18, 1995.

Participant, California Public Utilities Commission, Full Panel Hearing on Universal Telephone Service, September 29, 1995.

"Incentive Regulation and Competition: Reply Comments," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 18, 1995 (with Richard L. Schmalensee and William E. Taylor).

"Incentive Regulation and Competition: Issues for the 1995 Incentive Regulation Review," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 8, 1995 (with Richard L. Schmalensee and William E. Taylor).

"Preserving Universality of Subscription to Telephone Service in an Increasingly Competitive Industry," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 1, 1995 (with Alfred E. Kahn).

Declaration of Timothy J. Tardiff and Lester D. Taylor on the toll and carrier access demand stimulation caused by the January 1, 1995 price reductions, prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, September 1, 1995.

"Economic Evaluation of Proposed Long-Run Incremental Cost (LRIC) Methodology," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, July 13, 1995 (with Richard D. Emmerson).

"California Public Utilities Commission Proposed Rules for Local Competition: An Economic Evaluation," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, May 24, 1995.

"Benefits and Costs of Vertical Integration of Basic and Enhanced Telecommunications Services," prepared for filing with the Federal Communications Commission, Computer III Further Remand Proceedings, CC Docket No. 95-20, on behalf of Bell Atlantic, Bell South, NYNEX, Pacific Bell, Southwestern Bell, and U S West, April 6, 1995 (with Jerry A. Hausman).

"Evaluation of the MCI's Universal Service Funding Proposal," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, March 10, 1995.

"Franchise Services and Universal Service," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, March 10, 1995 (with Richard D. Emmerson).

Illinois Commerce Commission on behalf of GTE North: surrebuttal testimony on the benefits of intraMSA presubscription, September 30, 1994.

Illinois Commerce Commission on behalf of GTE North: rebuttal testimony on the benefits of intraMSA presubscription, September 16, 1994.

"Economic Evaluation of OIR/OII on Open Access and Network Architecture Development: Reply Comments," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, March 31, 1994 (with Richard D. Emmerson).

"Declaration of Timothy J. Tardiff on Pacific Bell's Productivity Under Price Caps," prepared for filing with the Federal Communications Commission, on behalf of Pacific Bell, February 28, 1994.

"Regulation of Mobile and Wireless Telecommunications: Economic Issues," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, February 25, 1994

"Economic Evaluation of OIR/OII on Open Access and Network Architecture Development," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, February 8, 1994 (with Richard D. Emmerson).

"Access to Intelligent Networks: Economic Issues," prepared for filing with the Federal Communications Commission, on behalf of Pacific Bell, December 1, 1993.

"The Effect of SFAS 106 on Economy-Wide Wage Rates," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, October 1, 1993

"Economic Evaluation of the NRF Review: Reply Comments," prepared for filing with the California Public Utility Commission on behalf of Pacific Bell, May 7, 1993. William E. Taylor and Timothy J. Tardiff, Study Directors.

"Performance Under Alternative Forms of Regulation in the U.S. Telecommunications Industry," prepared for filing with the Canadian Radio-television and Telecommunications Commission on behalf of AGT Limited, April 13, 1993. Timothy J. Tardiff and William E. Taylor, Study Directors.

"Pacific Bell's Performance Under the New Regulatory Framework: An Economic Evaluation of the First Three Years," prepared for filing with the California Public Utility Commission on behalf of Pacific Bell, April 8, 1993. William E. Taylor and Timothy J. Tardiff, Study Directors.

"Pricing Interconnection and the Local Exchange Carrier's Competitive Interstate Services," prepared for filing with the Federal Communications Commission, on behalf of Pacific Bell, February 19, 1993.

"The Treatment of FAS 106 Accounting Changes Under Price Cap Regulation: Reply Comments," prepared for filing with the Federal Communications Commission on behalf of Pacific Bell, July 1992. William E. Taylor and Timothy J. Tardiff, Study Directors.

"Costs and Benefits of IntraLATA Presubscription," prepared for filing with the State of New York Public Service Commission on behalf of New York Telephone, May 1, 1992. Timothy J. Tardiff and William E. Taylor, Study Directors.

"The New Regulatory Framework 1990-1992: An Economic Review," prepared for filing with the California Public Utility Commission on behalf of Pacific Bell, May 1, 1992. William E. Taylor and Timothy J. Tardiff, Study Directors.

"The Treatment of FAS 106 Accounting Changes Under Price Cap Regulation," prepared for filing with the Federal Communications Commission on behalf of Pacific Bell, April 15, 1992. William E. Taylor and Timothy J. Tardiff, Study Directors.

"The Treatment of FAS 106 Accounting Changes Under Pacific Bell's Price Regulation Plan: Economic Analysis of the DRA Supplemental Testimony," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, January 21, 1992. William E. Taylor and Timothy J. Tardiff, Study Directors.

"The Treatment of FAS 106 Accounting Changes Under Pacific Bell's Price Regulation Plan," prepared for filing with the California Public Utilities Commission on behalf of Pacific Bell, November 15, 1991. William E. Taylor and Timothy J. Tardiff, Study Directors.

California Public Utilities Commission on behalf of Pacific Bell: economic principles for pricing flexibility for Centrex service, Filed November 1990.

Expert Witness on State Transportation Energy Forecasting, California Energy Commission, Sacramento, September 1980.

SELECTED CLIENT REPORTS

Imputation Tests for Bundled Services, With Greg Houston, Carol Osborne, and Jennifer Fish, Prepared for the Australian Competition and Consumer Commission, January 2003.

Anticompetitive Bundling Strategies, With Greg Houston, Carol Osborne, and Jennifer Fish, Prepared for the Australian Competition and Consumer Commission, January 2003.

Enhancing Competition for Broadband Services: The Case for Removing the Prohibition against High-Speed InterLata Transmission by Regional Bell Operating Companies, With Alfred E. Kahn, Prepared for the United States Telecom Commission, May 22, 2000 (released April 2001).

An Economic Evaluation of Network Cost Models, With Jaime d'Almeida, William Taylor, and Charles Zarkadas, Prepared for Telecordia Technologies, August 2000.

An Analysis of Resale in Long Distance Telecommunications Markets, With William E. Taylor and J. Douglas Zona (Confidential) Prepared for plaintiffs in Darren B. Swain, Inc. d/b/a U.S. Communications v. AT&T Corp., November 15, 1995.

An Analysis of Long Distance Telecommunications Markets, With William E. Taylor and J. Douglas Zona (Confidential) Prepared for plaintiffs in US WATS, Inc. and USW Corp. v. AT&T Corp., August 22, 1995.

Economic Significance of Interconnection, Prepared for Japan Telecom, June 1995.

The Effect of Competitive Entry into Local Exchange and State Toll Markets on the Revenues of Southern New England Telephone, with J.D. Zona, (Confidential), Prepared for Southern New England Telephone, February 1995.

Long-Distance Call Alert (LDCA) Study: Customer Choice Model Findings, with C.J. Zarkadas, (Confidential), Prepared for Southwestern Bell, August 9, 1994.

Pricing Principles for LEC Services, (with R.D. Emmerson), Prepared for BellSouth Communications, July 8, 1994.

Quantifying the Handicaps of Unequal Access, (Confidential) Prepared for Japan Telecom, January 1994.

Overcoming Unequal Access: The International Experience, with S. Krom, (Confidential) Prepared for Japan Telecom, January 1994.

Market Potential For Cellular Radio And Other Personal Communications Products. (Confidential) Prepared for Pac Tel Corporation, July 1990.

Customer Demand for Local Telephone Services: Models and Applications. Prepared for South Central Bell Telephone Company, August 1987.

Evaluation Plans for Conservation and Load Management Programs. Prepared for New England Electric System, July 1987.

Telecommunications Competition for Large Business Customers in New York (Confidential). Prepared for NYNEX Corporation, June 1987.

Demand for Intrastate Long Distance Optional Calling Plans by Business and Residential Customers, with J.A. Hausman and A. Jaffe, (Confidential), Prepared for Southern New England Telephone, December 1985

"Estimation of Residential Conservation Service Program Electricity Savings," Prepared for Southern California Edison Company, July 1984.

The Demand for Local Telephone Service Upon the Introduction of Optional Local Measured Service. In part. Final report, prepared for Southern New England Telephone, July 1982.

Transit Strategies to Improve Air Quality in the Philadelphia Region. In part. Final report prepared for the Delaware Valley Regional Planning Commission, April 1982.

Estimation of Energy Impacts of State Transportation Improvement Program Projects. In part. Final report prepared for the California Energy Commission, January 1982.

Consumer Representation for Transportation Energy Conservation. In part. Final report prepared for the U.S. Department of Energy, July 1981.

Indicators of Supply and Demand for Transportation Fuels. In part. Prepared for the California Energy Commission, December 1980.

State of the Art in Research on Consumer Impacts of Fuel Economy Policies: Recent Findings and Recommendations for Further Research. In part. Prepared for the National Highway Traffic Safety Administration, January 1980.

SELECTED PUBLICATIONS AND PRESENTATIONS

Tardiff, T.J. and Taylor, "Aligning Price Regulation with Telecommunications Competition," *Review of Network Economics*, Vol. 2, 2003, December. An earlier version was presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Competition, 22nd Annual Conference, Skytop, Pennsylvania, May 22, 2003.

Tardiff, T. J., "Product Bundling and Wholesale Pricing," in G. Madden, ed., *Emerging Telecommunications Networks, The International Handbook of Telecommunications Economics, Volume II*, Cheltenham: Edward Elgar, 2003.

R.W. Crandall, R.W. Hahn, and T.J. Tardiff, "The Benefits of Broadband and the Effect of Regulation," in R.W. Crandall and J. Alleman, eds., *Broadband: Should We Regulate High Speed Internet Access?,* Washington: AEI-Brookings Center Joint for Regulatory Studies, 2002.

Tardiff, T. J., "Universal Service," in M.A. Crew and J.C. Schuh, eds., *Markets, Pricing, and Deregulation of Utilities*, Boston: Kluwer, 2002.

Tardiff, T.J., "Pricing Unbundled Network Elements and the FCC's TELRIC Rule: Economic and Modeling Issues," *Review of Network Economics*, Vol. 1, Issue 2, 2002, pp. 132-146. An earlier version was presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Competition, 21st Annual Conference, Newport, Rhode Island, May 23, 2002.

Tardiff, T.J., "Valuing the Use of Incumbent Telecommunications Networks," Presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Competition, 20th Annual Conference, Tamiment, Pennsylvania, May 24, 2001.

Tardiff, T.J., "State of Competition for Local Exchange Services: Implications for Telecommunications Policy," Presented at the Law Seminars International 2nd Annual Conference on Telecommunications in the Southwest, Phoenix, Arizona, February 15, 2001.

Tardiff, T.J., "New Technologies and Convergence of Markets: Implications for Telecommunications Regulation," *Journal of Network Industries*, Vol. 1, No. 4, 2000, pp. 447-468. Also presented at the Thirteenth Biennial Conference of the International Telecommunications Society, Buenos Aires, Argentina, July 3, 2000

Tardiff, T. J., "Cost Standards for Efficient Competition," in M.A. Crew, ed., *Expanding Competition in Regulated Industries*, Boston: Kluwer, 2000. Also presented at the Competitive Entry in Regulated Industries Seminar, Rutgers University Center for Research in Regulated Industries, Newark, New Jersey, October 22, 1999.

Tardiff, T.J., "Demand for High-Speed Services: Implications for RBOC Entry Into InterLATA Services," Presented at the 2000 International Communications Forecasting Conference, Seattle, Washington, September 28, 2000.

Tardiff, T.J., "Universal Access to Telephone Service and Implications of the USO," Presented at the Rutgers University, Center for Research in Regulated Industries, 8th Conference on Postal and Delivery Economics, Vancouver, Canada, June 10, 2000

Tardiff, T.J., "Universal Access to Telephone Service: Theory and Practice," Presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Competition, 19th Annual Conference, Lake George, New York, May 25, 2000.

Tardiff, T.J., "The Forecasting Implications of Telecommunications Cost Models," and "Forward-Looking Telecommunications Cost Models," in J. Alleman and E. Noam, eds., *The New Investment Theory of Real Options and its Implications for Telecommunications Economics*, Boston: Kluwer, 1999. The first article was also presented at the 1999 International Communications Forecasting Conference, Denver, Colorado, June 17, 1999.

Kahn, A.E., Tardiff, T.J., and Weisman, D.L, "The Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the Federal Communications Commission," *Information Economics and Policy*, Vol. 11, No. 4, December 1999, pp. 319-365.

Tardiff, T.J., "Effects of Large Price Reduction on Toll and Carrier Access Demand in California," in L.D. Taylor and D.G. Loomis, *The Future of the Telecommunications Industry: Forecasting and Demand Analysis*, Boston: Kluwer, 1999. Also presented at the 1996 International Communications Forecasting Conference, Dallas, Texas, April 18, 1996.

W.A Grieve and T.J. Tardiff, "Universal Service in the United States and Canada: Funding High-Cost Areas," Presented at the Telecommunications Policy Research Conference, Alexandria, Virginia, September 27, 1999.

Tardiff, T.J., "The Growth of Local Exchange Competition: Implications for Telecommunications Regulation," Presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Competition, 12th Annual Western Conference, San Diego, California, July 8, 1999.

Tardiff, T.J., "Trends in Local Exchange Competition," Presented at the 25th Annual Rate Symposium, St. Louis, Missouri, April 27, 1999.

Tardiff, T.J., "Regional Bell Operating Company InterLATA Entry and the Public Interest," Presented at the 25th Annual Rate Symposium, St. Louis, Missouri, April 26, 1999.

Tardiff, T.J., "Cost Standards for Pricing Unbundled Elements and Retail Services," Presented at the Institute for International Research Fourth Annual Conference for Competitive Pricing of Telecommunications Services, Washington, DC, March 25, 1999.

Tardiff, T.J., Speaker: Cost of Hypothetical Providers vs. Real Providers Panel, INDETEC International, Cost and Public Policy: 1999, February 10, 1999.

Tardiff, T.J. Discussant: "TELRIC: An Overview," Presented at The Columbia University New Investment Theory of Real Options and its Implications for the Cost Models in Telecommunications Conference, New York, New York, October 2, 1998.

Tardiff, T.J., Workshop Leader, Wholesale and Retail Pricing Workshop, Presented at the Institute for International Research Third Annual Conference for Competitive Pricing of Telecommunications Services, Chicago, IL, July 22, 1998.

Tardiff, T.J., "Pricing Essential Inputs and Efficient Competition," Presented at the Rutgers University, Center for Research in Regulated Industries, Advanced Workshop in Regulation and Public Utility Economics, 11th Annual Western Conference, Monterey, California, July 9, 1998.

Tardiff, T.J., "Incremental Cost Basis for Interconnection Pricing," Presented at the Institute for International Research Interconnection '98 Conference, Washington, D.C., April 29, 1998.

Tardiff, T.J., "Regulatory Implications of Local Exchange Cost Models," Presented at the 24th Annual Rate Symposium, Kansas City, Missouri, April 28, 1998.

Tardiff, T.J., "What's Happening in Local Competition," Presented at the 24th Annual Rate Symposium, Kansas City, Missouri, April 27, 1998.

Tardiff, T.J. "Pricing and New Product Options with Telecommunications Competition," in D.R. Dolk, ed., *Proceedings of the Thirty-First Annual Hawaii International Conference on Systems Sciences, Vol. V, Modeling Technologies and Intelligent Systems Track,* Los Alamitos: IEEE Computer Society, January 6-9, 1998, pp. 416-425.

Froeb, L.M., T.J. Tardiff, and G.J. Werden, "The Demsetz Postulate and the Effects of Mergers in Differentiated Products Industries," in F.S. McChesney, ed., *Economic Inputs, Legal Outputs: The Role of Economists in Modern Antitrust*, New York: Wiley, 1998. Also presented at the Annual Meeting of the American Economics Association, Washington, D.C. January 8, 1995.

Tardiff, T.J., "Pricing and Product Offerings for the New Competitive Telecommunications Environment," Presented at the Canadian Institute Competitive Strategies Telecommunications Conference, Toronto, Canada, September 29, 1997.

Tardiff, T.J., "Cost Basis for Pricing: Embedded or Incremental," Presented at the Institute for International Research Cost Allocation Forum, Atlanta, Georgia, September 17, 1997.

Tardiff, T.J. "Costing and Pricing for Local Exchange Competition: Experience Under the U.S. Telecommunications Act," in P. Enslow, P. Desrochers, and I. Bonifacio, eds., *Proceedings of the Global Networking '97 Conference,* Amsterdam: IOS Press, June 15-18, 1997, pp. 286-292.

Tardiff, T.J., "Unbundling and Resale: Lessons from South of the Border," presented at the Bell Canada Total Competition Briefing Session, Toronto, Canada, April 16, 1997.

Tardiff, T.J., "Unbundling and Resale Under the Telecommunications Act and the FCC's Interconnection Order: Implications for Industry Structure and Competitive Strategies," presented at the International Communications Group Telecommunications Business Environment Conference, Denver, Colorado, January 7, 1997.

Hausman, J. and T. Tardiff, "Valuation of New Services in Telecommunications," in A. Dumont and J. Dryden, *The Economics of the Information* Society,Luxembourg: Office for Official Publications of the European

Communities, 1997, pp. 76-80. Also presented to the OECD Workshop on the Economics of the Information Society, Toronto, Canada, June 28, 1995.

Tardiff, T.J., "Universal Service with Full Competition," in S.L. Hansen, ed., *Universal Service with Network Competition*, University of Auckland, 1996, pp. 51-64. Also presented at the Eleventh Biennial Conference of the International Telecommunications Society, Seville, Spain, June 18, 1996 and on my behalf by J. Oliver at the Telecommunications Universal Service Symposium, Wellington, New Zealand, July 2, 1996.

Tardiff, T.J., "Efficient Pricing of Competitive Local Exchange Services: Understanding the Costing Principles," presented at the Institute for International Research Conference on Competitive Costing Strategies for Local Exchange Services, New Orleans, Louisiana, October 24, 1996.

Tardiff, T. J. and Taylor, W.E., "Revising Price Caps: The Next Generation of Incentive Regulation Plans," in M.A. Crew, ed., *Pricing and Regulatory Innovations Under Increasing Competition*, Norwell, MA: Kluwer, 1996, pp. 21 - 38. Also presented at the Rutgers University Center for Research in Regulated Industries Research Seminar, May 3, 1996.

Tardiff, T.J., "New Product and Pricing Options for the Competitive Telecommunications Environment: Lessons from Consumer Choice Studies," presented at the International Communications Group Business Opportunities in Telecommunications Conference, Denver, Colorado, July 31, 1996.

Tardiff, T.J., "Efficient Local Competition and Universal Service," presented at the International Communications Group Business Opportunities in Telecommunications Conference, Denver, Colorado, July 31, 1996.

Tardiff, T.J., "Pricing and Product Offerings in a Competitive Environment," presented at the Canadian Institute Conference on Telecommunications Pricing, Toronto, Ontario, Canada, March 7, 1996.

Werden, G.J., Froeb, L.M., and Tardiff, T.J. "The Use of the Logit Model in Applied Industrial Organization," *International Journal of the Economics of Business*, Vol. 3, No. 1, 1996, pp. 83-105.

Tardiff, T.J. "Incentive Regulation and Competition: The Next Generation," presented at the 27th Annual Conference of the Institute of Public Utilities at Michigan State University, Williamsburg, Virginia, December 12, 1995.

Tardiff, T.J., "Effects of Presubscription and Other Attributes on Long-Distance Carrier Choice," *Information Economics and Policy*, Vol. 7, No. 4, December 1995, pp. 353-366. Also presented at the 1994 National Telecommunications Forecasting Conference, Boston, Massachusetts, May 24, 1994.

Tardiff, T.J. and J.D. Zona, "Effects of Competitive Entry on Capital Recovery," presented at the United States Telephone Association Capital Recovery Seminar, Chicago, Illinois, October 19, 1995.

Tardiff, T.J. and L.J. Perl, "Price Regulation and Productivity," presented to the Public Staff of the North Carolina Utilities Commission, Raleigh, North Carolina, September 6, 1995.

Hausman, J.A. and T.J. Tardiff, "Efficient Local Exchange Competition," *Antitrust Bulletin*, Vol. 40, No. 3, Fall 1995, pp. 529-556.

Instructor, "Seminar in Current Economic Issues", United States Telephone Association course, Orlando, Florida, April 3-5, 1995.

Tardiff, T.J., W.E. Taylor, and C.J. Zarkadas, "Periodic Review of Price Cap Plans: Economic Issues," presented at the Telecommunications Policy Research Conference, Solomons, Maryland, October 2, 1994.

Participant in AGT International Symposium on Local Interconnection Policy, Emerald Lake, British Columbia, Canada, May 27-28, 1994.

Tardiff, T.J., "Access Charges and Toll Prices in the United States: An Economic Evaluation," Presented to representatives of Japanese Long-Distance Companies, New York, New York, May 16, 1994.

Tardiff, T.J. and W.E. Taylor, "Telephone Company Performance Under Alternative Forms of Regulation in the U.S.," presented at the Telecommunications Policy Research Conference, Solomons, Maryland, October 4, 1993.

Tardiff, T.J., "Interconnection and LEC Competitive Services: Pricing and Economic Efficiency," presented at the Telestrategies Conference: The Access Charge Revolution, Washington, D.C. May 18, 1993.

Hausman, J., T. Tardiff, and A. Belinfante, "The Effects of the Breakup of AT&T on Telephone Penetration in the United States," *The American Economic Review*, Vol. 83, May 1993, pp. 178-184.

Tardiff, T.J., "Assessing the Demand for New Products and Services: Theory and Practice," presented at the NRRI Conference on Telecommunications Demand for New and Existing Services, Denver, Colorado, August 6, 1992.

Tardiff, T.J., "Price and Cost Standards for Increasingly Competitive Telecommunications Services," presented at the Ninth International Conference of the International Telecommunications Society, Sophia Antipolis, France, June 17, 1992.

Tardiff, T.J. "Modeling The Demand For New Products and Services,' presented at the NTDS Forum, Santa Fe, New Mexico, September 27, 1991.

Tardiff, T.J. and C. Zarkadas, "Forecasting Tutorial," presented at the National Telecommunications Forecasting Conference, May 29, 1991.

Tardiff, T.J. and W.E. Taylor, "Pricing the Competitive Services of Regulated Utilities," National Economic Research Associates, Working Paper No. 7, May 1991.

Hausman, J.A. and T.J. Tardiff, "Growth in New Product Demand Taking into Account The Effects of Price and Competing Products: Mobile Telecommunications," Presented at the Massachusetts Institute of Technology Telecommunications Business and Economics Program Second Annual Symposium, Cambridge, Massachusetts, November 1990.

Tardiff, T.J., "Structuring Telecommunications in Other Countries: View from the UK, Europe and Canada," Presented at the United State Telephone Association Affiliated Interest Issues Committee 1990 Fall Conference, Traverse City, Michigan, September 1990.

Tardiff, T.J. and M.O Bidwell, Jr., "Evaluating a Public Utility's Investments: Cash Flow vs. Revenue Requirement," *Public Utilities Fortnightly*, May 10, 1990.

Tardiff, T.J. and C.J. Zarkadas, "Forecasting Demand for New Services: Who, What, and When," Presented at the Bellcore/Bell Canada Demand Analysis Forum, Hilton Head South Carolina, April 1990.

Tardiff, T.J., "Consumer Welfare with Discrete Choice Models: Implications for Flat versus Measured Local Telephone Service," Presented at the Bellcore/Bell Canada Demand Analysis Forum, Hilton Head South Carolina, April 1990.

Tardiff, T.J., "Telephone Regulation in California: Towards Incentive Regulation and Competition," Presented to the Bell Canada Economic Council, Hull, Quebec, Canada, February 1990.

Tardiff, T.J., "Measuring Competitiveness in Telecommunications Markets," in National Economic Research Associates, *Telecommunications in a Competitive Environment*. Proceeding of the Third Biennial Telecommunications Conference, Scottsdale, Arizona, April 1989, pp. 21-34.

Hausman, J.A., T.J. Tardiff, and H. Ware, "Competition in Telecommunications for Large Users in New York," in National Economic Research Associates, *Telecommunications in a Competitive Environment*. Proceeding of the Third Biennial Telecommunications Conference, Scottsdale, Arizona, April 1989, pp. 1-19.

Perl, L.J. and T.J. Tardiff, "Effects of Local Service Price Structures on Residential Access Demand," Presented at the International Telecommunications Society North American Regional Meeting, Ottawa, Ontario, Canada, June 1989.

Tardiff, T.J. and W.E. Taylor, "Costing Principles for Competitive Assessment," in *Telecommunications Costing in a Dynamic Environment*, Proceedings of the Bellcore-Bell Canada Conference on Telecommunications Costing, 1989, pp. 497-518.

Tardiff, T.J., "Forecasting the Impact of Competition for Local Telephone Services." Presented at the Bellcore National Forecasting Conference, New Orleans, April 1987.

Tardiff, T.J., "Is Bypass Still a Threat," in National Economic Research Associates, *Telecommunications in a Competitive Environment*. Proceedings of Conference held in Scottsdale, Arizona, March 1987, pp. 27-41.

Tardiff, T.J., "Benefit Measurement with Customer Choice Models." Presented at the Bellcore Telecommunications Demand Modeling Conferences, New Orleans, October 1985.

Tardiff, T.J., "The Economics of Bypass," Presented at the Bellcore Competitive Analysis and Bypass Tracking Conference. Denver, March 1985.

Tardiff, T.J., "Class of Service Choice Model." Presented at the Telecommunications Marketing Forum. Chicago, September 1984.

Tardiff, T.J., "Demand for New Telecommunications Product and Services." Presented at the Fifth International Conference on Futures Analyses, Forecasting and Planning for Telecommunications. Vancouver, July 1984.

Tardiff, T.J., "Pricing and Marketing in the Competitive Local Access Market." In Present and Future Pricing Issues in Electric, Gas, and Telecommunications Industry. Proceeding of the Ninth Annual Rate Symposium on Problems of Regulated Industries. Columbia: University of Missouri, 1983.

Tardiff, T.J., J. Hausman and A. Baughcum, "The Demand for Optional Local Measured Service." In Adjusting to Regulatory, Pricing and Marketing Realities. Proceedings of the Fourteenth Annual Conference of the Institute of Public Utilities. East Lansing: Michigan State University, 1983.

Tardiff, T.J., W.B. Tye, L. Sherman, M. Kinnucan, and D. Nelson, *Application of Disaggregate Travel Demand Models*. National Cooperative Highway Research Program Report 253, 1982.

Tardiff, T.J., D. Wyckoff, and B. Johnson, "Shippers' Preferences for Trucking Services: An Application of the Ordered Logit Model." *Proceedings of the Transportation Research Forum*, Vol. 23, 1982.

Tardiff, T.J., P. M. Allaman, and F. C. Dunbar, *New Approaches to Understanding Travel Behavior*. National Cooperative Highway Research Program Report 250, 1982.

Tardiff, T.J., E. Ziering, J. Benham and D. Brand, "Energy Impacts of Transportation System Improvements." *Transportation Research Record* 870: 10-15, 1982.

Tardiff, T.J. and O.S. Scheffler, "Destination Choice Models for Shopping Trips in Small Urban Areas." *Proceedings of the Transportation Research Forum*, Vol. 22, 1982.

Tardiff, T.J., J.L. Benham and S. Greene, *Methods for Analyzing Fuel Supply Limitations on Passenger Travel*. National Cooperative Highway Research Program Report 229, 1980.

Tardiff, T.J., "Vehicle Choice Models: Review of Previous Studies and Directions for Further Research." *Transportation Research* 14A: 327-336, 1980.

Tardiff, T.J., "Specification Analysis for Quantal Choice Models." *Transportation Science* 13: 179-190.

Tardiff, T.J., "Attitudinal Market Segmentation for Transit Design, Marketing and Policy Analysis." *Transportation Research Record* 735: 1-7, 1979.

Tardiff, T.J., "Definition of Alternatives and Representation of Dynamic Behavior in Spatial Choice Models." *Transportation Research Record* 723: 25-30, 1979.

Tardiff, T.J., "Use of Alternative Specific Constants in Choice Modeling." Institute of Transportation Studies, University of California, Berkeley and Irvine, Report No. UCI-ITS-SP-78-6, December 1978.

Tardiff, T.J. and G.J. Fielding, "Relationship Between Social-Psychological Variables and Individual Travel Behavior." *Proceedings of the Transportation Research Forum*, Vol. 19, 1978.

Tardiff, T.J., T.N. Lam, and B.F. Odell, "Effects of Employment and Residential Location Choices on Urban Structure: A Dynamic Stochastic Simulation." *Transportation Research Record* 673: 86-93, 1978.

Tardiff, T.J., "Casual Inferences Involving Transportation Attitudes and Behavior." *Transportation Research* 11: 397-404, 1977.

Tardiff, T.J., "A Note on Goodness of Fit Statistics for Probit and Logit Models." *Transportation* 5: 377-388, 1976.

Tardiff, T.J., "The Effects of Socioeconomic Status on Transportation Attitudes and Behavior." Ph.D. Dissertation, School of Social Science, University of California, Irvine, 1974. December 2003