Assessing Wireless and Broadband Substitution in Local Telephone Markets

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EXECUTIVE SUMMARY

Wireless and broadband services are increasingly substitutable for and competitive with wireline services in the markets for basic local telephone service. State commissions are often charged with monitoring competitive conditions in their states and adapting policy to changing conditions. Failure to consider the competitive effect of wireless and broadband services in local telephone markets will bias competitive analyses towards concluding that incumbent wireline providers have more market power than they actually do and lead to more intervention than is necessary to achieve public interest outcomes. Conversely, assuming that the availability of wireless and broadband services automatically makes local telephone markets workably competitive will bias competitive analyses towards concluding that incumbent wireline providers have less market power than they actually do and lead to less intervention than is necessary to achieve public interest outcomes.

Assessing competitive conditions in a market and determining whether a firm or group of firms has market power requires defining the market in product and geographic terms, determining which producers and consumers are part of the market, measuring market shares and/or other indicators of the competitiveness of the market, and making a determination as to whether the market is or is not workably competitive.

This report discusses market power and its measurement, discusses convergence and intermodal or platform competition, provides examples of state approaches to including wireless and broadband services in competition and market power analyses, and offers recommendations for more explicitly including wireless and broadband services in competitive analyses.

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Acronyms

BiG	Broadband in Gas
BOC	Bell Operating Company
BPL	Broadband over Power Lines
CAP	Competitive Access Provider
CLEC	Competitive Local Exchange Carrier
CSO	Cable Television System Operator
DOJ	U.S. Department of Justice
DNS	Domain Name System
DPS	Department of Public Service (New York)
DSL	Digital Subscriber Line
EU	European Union
FCC	Federal Communications Commission
FPSC	Florida Public Service Commission
FTC	Federal Trade Commission
GHz	GigaHertz
HHI	Hirschman-Herfindahl Index
ICC	Illinois Commerce Commission
ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
IUB	Iowa Utilities Board
IURC	Indiana Utility Regulatory Commission
LAN	Local Area Network
LATA	Local Access and Transport Area

MC	Marginal cost of output
NANPA	North American Numbering Plan Administrator
NRUF	Numbering Resource Utilization/Forecast
OPEC	Organization of the Petroleum Exporting Countries
PDA	Personal Digital Assistant
POTS	Plain Old Telephone Service
PSC	Public Service Commission
PSTN	Public Switched Telephone Network
PUC	Public Utility Commission
S-C-P	Structure-Conduct-Performance
SLC	Subscriber Line Charges
SSNIP	Small but significant and non-transitory increase in price
TELRIC	Total Element Long Run Incremental Cost
UNE	Unbundled Network Element
UNE-L	Unbundled Network Element Loop
U.S.C.	United States Code
VoIP	Voice over Internet Protocol
WAN	Wide Area Network
Wi-Fi	Wireless Fidelity
WiLAN	Wireless Local Area Network
Wi-MAX	Worldwide Interoperability for Microwave Access

I. Introduction

The competitiveness of a market depends on the availability of reasonable substitutes for the relevant product. In markets for basic local telephone service, wireless and broadband services are becoming more important as competitive platforms or technologies. State commissions are often charged with monitoring competitive conditions in their states and adapting policy to changing conditions. But many have not begun to give explicit consideration of platform or technology competition. Nevertheless, when assessing the competitiveness of the market for basic local telephone service,[1] analysts should consider the extent to which wireless and broadband services are available and are viewed by consumers as reasonable substitutes for traditional wireline service. Failure to do so will bias competitive analyses towards concluding that incumbent wireline providers have more market power over basic local telephone service than they actually do and lead to more intervention than is necessary to achieve public interest outcomes. Conversely, assuming that the availability of wireless and broadband services automatically makes local telephone markets fully competitive will bias competitive analyses towards concluding that incumbent wireline providers have less market power than they actually do and lead to less intervention than is necessary. The purpose of this report is to discuss market power and its measurement, describe convergence and intermodal or platform competition, provide examples of state approaches to including wireless and broadband services in competition analyses, and offer recommendations for more explicitly including wireless and broadband services in competitive analyses.

A. The Telecommunications Act of 1996 and competition in local telecommunications

On February 8, 1996, the Telecommunications Act of 1996 (the 1996 Act) was signed into law. The 1996 Act allowed competitive local exchange carriers (CLECs) to offer switched local telephone service[2] in competition with the incumbent local exchange carriers (ILECs).[3]

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[1] In defining basic local telephone service, we rely on the list of functions and services the FCC requires that eligible telecommunications carriers offer residential and business customers in order to receive universal service support: voice grade access to the public switched network, with the ability to place and receive calls; local usage; Dual Tone Multifrequency signaling (e.g., Touchtone®) or its functional equivalent; single-party service; access to emergency services, including in some instances, access to 911 and enhanced 911 services; access to operator services; access to interexchange (long-distance) services; access to directory assistance; and toll limitation services for qualifying low-income consumers. See FCC 97-157, *Report and Order* in CC Docket 96-45, released May 8, 1997, ¶ 22 and ¶ 56; and 47 C.F.R. §54.101.

[2] Switched local telephone service allows a user to place calls to or receive calls from other local telephone customers. Switched local service uses telephone numbers to address calls which are routed or directed to their destination by a switch. Switched service may be contrasted with special access service, which relies on leased lines that are not directly accessible via standard telephone numbers.

The underlying theory of the 1996 Act was that competition would benefit consumers by leading to lower prices, more choices, and more rapid technological advancement in telecommunications.[4]

Before the 1996 Act was passed, a few states, including Illinois, Maryland, and New York, had begun allowing competition in local switched service.[5] In general, however, there was

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[3] Incumbent local exchange carriers (ILECs) are the local exchange carriers (LECs) serving state-designated franchised areas on the date that the Telecommunications Act of 1996 was enacted. See 47 U.S.C. 251(h). ILECs are divided into the Bell Operating Companies (BOCs) and independents: BOCs are the former local operating companies of the Bell System; all other ILECs are independents. For a listing of the BOCs, see 47 U.S.C. 151 (4). A firm may operate as an ILEC in its original home area and as a CLEC in other areas.

[4] The Telecommunications Act of 1996 (P.L. 104-104), codified at 47 U.S.C. 151, et seq., amends the Communications Act of 1934. The 1996 Act's Preamble describes it as:

> An Act to promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.

Communications Act of 1934 as Amended by the Telecommunications Act of 1996 (Washington, D.C.: U.S. Government Printing Office, March 1996) at 309.

[5] Prior to passage of the Telecommunications Act of 1996, several states had taken significant steps towards local competition.

In 1985, the New York Public Service Commission (NYPSC) allowed competition for provision of local exchange private line services; in 1989, the PSC required an incumbent to provide competitors virtual collocation for provision of private line services; in 1991, the NYPSC required incumbents to provide physical collocation for provision of private line services and ordered loop unbundling for Centrex and private branch exchange (PBX) services; in 1992, the NYPSC expanded collocation requirements to include switched services. In 1993, the NYPSC became the first state commission to authorize local exchange service competition when it provided for interconnection agreements between an incumbent and local competitors. In 1994, the NYPSC approved a restructuring plan for Rochester Telephone (the Open Market Plan) that included provisions for competitors to interconnect with the incumbent and to purchase local service at a wholesale rate and resell it. In 1995, the NYPSC required NYNEX to offer a discount to resellers for residential service. See New York Department of Public Service (2005) 14-16; Dingwall (1995), 113.

In 1994, the Illinois Commerce Commission ordered Illinois Bell to make its residential services available for resale to competitive carriers that were certified to provide local exchange services. See Chiu (2006), 3 and n. 12 (citing "Illinois Bell Telephone Company Proposed Introduction of a Trial of Ameritech's Customers First Plan," *Order* in Illinois Commerce Commission Docket No. 94-0096, April 7, 1995, pp. 66-67).

little competition to provide local switched access service.[6] Providers generally remained within narrow boundaries that have been termed "silos," allowing disparate regulatory treatment of providers and technologies depending on the silo into which they fell.[7] ILECs offered switched local telephone service within their franchised service areas; cable television systems operators (CSOs) provided video services within locally franchised areas; competitive access providers (CAPs) offered large users a means to bypass the local network when accessing long distance networks; private networks offered special access arrangements. But neither CSOs nor CAPs offered switched access to local telephone networks, in competition with the ILECs. Wireless service providers did offer a form of switched local service, but wireless was not viewed by most consumers as a reasonable substitute for basic local service due to a significant price differential between wireless and wireline service.[8] Sometimes the silos were created or maintained by government policies. For example, the consent decree between AT&T and the Department of Justice that led to AT&T's divestiture of the Bell Operating Companies enjoined them from entering the interstate long distance market and from manufacturing telephone equipment. In addition, exclusive state franchises kept neighboring local carriers from competing with one another and kept cable television systems from offering local service.

The 1996 Act eliminated state-mandated exclusive local franchises, thereby opening local markets to competitive entry via one or a combination of methods. The 1996 Act provided for several modes of local telephone competition: resale of ILEC retail services; lease of ILEC unbundled network elements (UNEs); and interconnection of facilities-based networks. In general, participants in the discussions leading to the 1996 Act envisioned competition based on then-existing wireline telephone technologies. Even facilities-based competition was envisioned as being based on existing circuit switched technology.

After the 1996 Act eliminated prohibitions on entry into local telephone markets, competition developed from a number of sources – from startup competitive local exchange carriers (CLECs), from existing interexchange (long distance) carriers such as AT&T and MCI

In 1994, the Maryland Public Service Commission approved applications by MFS, MCI, and Teleport to provide local service to business customers. See Dingwall (1995), 112 and n. 35.

[6] As an example of the lack of local competition prior to passage of the 1996 Act, competitive access providers and competitive local exchange carriers accounted for 0.7 percent of all local telephone revenues in 1995. See FCC (1998b), Table 2.1.

[7] For an example of the use of the silo metaphor, see Abernathy (2002). Abernathy noted that convergence would lead to the death of the silos, as providers from different platforms (wireline, wireless, cable, and satellite) compete with each other to offer integrated voice, data, and video services.

[8] In December 1995 (just prior to passage of the 1996 Act), although cellular wireless service had been offered since the mid-1980s, there were 33.8 million wireless subscribers in the U.S. compared with 166.3 million local wireline loops; in addition, the average monthly bill for cellular service was $51.00 compared with less than $20.00 for wireline service. See FCC (1998a), Tables 2.1, 13.1, 19.1.

that began offering local service, from CAPs that became CLECs, from cable television systems, and from ILECs entering markets outside their previously franchised areas.

Because local telephone competition started from almost nothing, during the eleven years since passage of the 1996 Act the FCC and state commissions developed processes and rules to facilitate the transformation of local telephone service from being relatively tightly regulated and monopoly-provided to being deregulated or lightly regulated and competitively provided. This transformation involved a number of steps. These steps included establishing rules for interconnection agreements between ILECs and CLECs, creating unbundling rules and pricing arrangements for UNEs, developing federal universal service programs to enable the removal of unsustainable or anticompetitive internal cross subsidies from retail rates, implementing local number portability,[9] and allowing the Bell Operating Companies (BOCs) to enter inter-LATA[10] long-distance markets after their local markets were open to competition.

As a result of the 1996 Act and federal and state implementation of it, CLECs were serving 34 million end user switched access lines (19.1 percent of the total) in June 2005 compared to 8.2 million CLEC lines (4.3 percent of the total) in December 1999.[11] The number of CLEC lines subsequently decreased to 29.8 million (17.3 percent of the total) by June 2006, with at least some of the decrease attributable to the withdrawal of the unbundled switching component at UNE rates under the FCC's Triennial Review Remand Order.[12]

Many changes in the telecommunications industry have occurred since passage of the 1996 Act. Though some changes have taken place at the corporate level, the underlying forces driving much of the change has been evolving technology, specifically the adaptation of communications to wireless and broadband technologies. As one observer wrote:

In 1996, seven Bell companies and GTE were the dominant providers of local service and 90% of all long distance traffic was carried by AT&T, MCI, and Sprint. Today, there are three Bell companies; there is no GTE; Verizon has acquired MCI; and the AT&T parent has been taken over by its SBC offspring. Cable companies are offering long distance, Internet, and video

[9] Local number portability allows customers to retain their telephone numbers when switching from an ILEC to a CLEC, between CLECs, between wireless providers, and when switching between a wireline and a wireless provider. Customers choosing a voice over internet protocol (VoIP) provider may also retain their existing number.

[10] A LATA is a "Local Access and Transport Area." Prior to the 1996 Act and its Section 271 relief, Bell Operating Companies could carry long distance calls within a LATA (intra-LATA traffic), but they could not carry calls across LATA boundaries or across state lines (inter-LATA traffic). Though a few states contained a single LATA, most were divided into two or more LATAs.

[11] FCC (2007a), Table 1.

[12] FCC (2005).

services. In addition, the explosion of Wi-Fi, and Wi-MAX[13] has revolutionized the traditional way of doing business. The Internet and wireless calling plans have made distance and geographic boundaries irrelevant. New and converging technologies have fostered the proliferation of communications options that were not even imagined ten years ago.[14]

This report is focused on the markets for local residential and small business service and determining whether there are sufficient competitive alternatives to constrain market power in that product space. There are several reasons for concentrating on basic service for residential and small businesses. First is a trend towards deregulation of service packages that bundle long distance and enhanced features with basic service.[15] Thus, basic local service is the product most closely regulated by state commissions. Second is state commission concern for universal

[13] Wi-Fi and Wi-MAX are two technical standards for wireless broadband access. Wi-Fi is based on the IEEE 801.11x standard (for example, 802.11b, 802.11g, and 802.11n) and is used for wireless local area networks or LANs. Wi-Fi offers a wireless broadband connection within a range of approximately 150 feet (indoors) to 300 feet (outdoors) between users and an antenna or "hot spot." Access to a Wi-Fi network requires an 802.11x compatible wireless card in a laptop computer, desktop computer, or device such as a Wi-Fi VoIP phone.

Home wireless broadband networks use a wireless router to provide Wi-Fi access. Many businesses such as restaurants, coffee shops and hotels provide free Wi-Fi access, and some municipalities offer public access to Wi-Fi networks. Because of its limited range and general lack of interconnected networks, standard Wi-Fi is not well suited for mobile voice service; however technological developments such as creation of a mesh of overlapping and coordinated Wi-Fi hotspots may improve its mobility. In addition, on the near horizon are "dual-mode" phones that can switch between standard cellular service and VoIP service over Wi-Fi where it is available. For information on dual-mode service, see Reardon (2006).

Wi-MAX stands for "Worldwide interoperability for Microwave Access." It is based on the IEEE 802.16-2005 standard (previously known as 802.16e). When deployed, Wi-MAX will offer improvements in speed, throughput, and capacity and will extend wireless broadband coverage areas. Wi-MAX goes beyond current broadband wireless internet access and may be capable of delivering high-speed fixed and mobile wireless broadband services to large areas with less infrastructure than is needed today for either current Wi-Fi or current cellular wireless service. Whereas Wi-Fi provides local area network wireless broadband connectivity, Wi-MAX provides metropolitan area network (MAN), with a range of up to 30 miles from an antenna.

By one estimate, in 2007, Wi-MAX deployment will begin as fixed-line data replacement with mobility services beginning in 2008. Usage drivers will be VoIP, Internet browsing, email and business applications. Initial limiting factors include the high cost of Wi-MAX compatible devices, limited service availability and spectrum scarcity. See Taylor, Wexler, and Moldovan (2007). For comparison of fixed and mobile broadband access technologies, see Newman (2005).

[14] Simon (2006), 590.

[15] Rosenberg and McGarvey (2005); Pérez-Chavolla (2007).

service, which is defined in terms of making a set of basic services available in all areas of each state at an affordable price.[16] Third is the likelihood that larger business (enterprise) customers have more competitive alternatives and are more sophisticated buyers of telecommunications services than are typical residential and small business customers.[17]

The competitive landscape in local telecommunications has changed. The competitiveness of a market depends on the availability of reasonable substitutes for the relevant product. Local competition as envisioned in the 1996 Act was assumed to be coming mainly from entrants using circuit switch technology to offer direct substitutes for traditional voice-grade service. That kind of competition exists, but future growth in local competition will not come from that source. Instead, the growth of local competition will come from the wireless and broadband platforms. It is important, therefore, that analysts assessing the competitiveness of basic local telephone service consider the extent to which wireless and broadband services are available and are viewed as reasonable substitutes for traditional wireline service.

This importance of wireless and broadband as competitive platforms has not gone unnoticed by the states. We illustrate with two quotes from recent state competition analyses. First, from the Illinois Commerce Commission's (ICC) most recent *Annual Report on Telecommunications Markets in Illinois*:[18]

> Total reported POTS lines in Illinois declined between year-end 2004 and year-end 2005 as they have each year since year-end 2001. Economic conditions in Illinois and the fact that consumers are relying on broadband services to obtain high-speed Internet access instead of relying on POTS service may explain, in part, the reported reductions. However, they do not likely explain the entire reduction. Rather, it is likely that part of the reduction in POTS lines is attributable to the fact that many substitutes for POTS are not being reported as CLEC POTS lines to the [ICC]. For example, it is becoming increasingly clear that some consumers are substituting mobile wireless phone service or unreported [VoIP] service for POTS service. The more consumers turn to such alternatives

[16] Universal service goals include ensuring that affordable and adequate quality telephone service is available to all residents and to all areas. These universal service goals lead to multiple state and federal support programs including support for basic service in high-cost areas and subsidies for low-income households. For a discussion of universal service, see Rosenberg, Pérez-Chavolla, and Liu (2006a); for information on state universal service programs, see Liu and Rosenberg (2006).

[17] Alternatively, it is possible to do separate studies of the large business or enterprise market and the residential/small business market. This is essentially the approach taken in the FCC's Triennial Review Order, which asked states to consider impairment in each market separately.

[18] Illinois Commerce Commission (2006).

> to POTS services, the less valuable an examination based solely of CLEC POTS market shares will be as a gauge of competition in local telephone market.[19]

Second, the Indiana Utility Regulatory Commission's (IURC) *2006 Telephone Report to the Regulatory Flexibility Committee of the Indiana General Assembly*[20] noted the necessity of obtaining complete data on competitive services:

> … [T]o obtain a true picture of the effects of competition in the telecommunications and video markets throughout Indiana, the IURC will be requesting data from all providers including wireless and other intermodal providers. Because of certain federal regulations, the IURC, as a state agency, does not have the authority to *require* certain types of providers to respond to data requests or surveys. However, … the IURC is moving forward and communicating directly with these providers, including VoIP carriers and Internet Service Providers, in an effort to encourage voluntary participation to complete the picture. …. The IURC decided to reach out to providers ahead of the July 2009 timeframe when the IURC will have the authority to require *all* communications service providers to obtain a Certificate of Territorial Authority.[21]

B. Organization of this report

This remainder of this report is organized into four sections.

Section II discusses competition, market structures, market power, and measures or indicators of market power. Section II also describes the approach to market power analysis used by the U.S. Department of Justice and the Federal Trade Commission when evaluating the market power implications of proposed mergers. Section II is important for understanding of the concept of market power and various measures or indicators of its existence. It is especially useful for readers who are not familiar with the concept of market power or its measurement.

Section III discusses convergence and its effect on product substitution and competition in local telephone markets. Given the possibility of substitutability and its contribution to competitiveness, Section III argues for the necessity of including these technologies in analyses

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[19] Ibid., 32. POTS = Plain Old Telephone Service. I.e., wireline service that allows users to make and receive calls, voice grade telephone service without additional features. See note 1, *supra*; cf., Newton (2006). The FCC defines voice-grade access as: a functionality that enables a user of telecommunications services to transmit voice communications, including signaling the network that the caller wishes to place a call, and to receive voice communications, including receiving a signal indicating there is an incoming call. Bandwidth for voice grade access should be, at a minimum, 300 to 3,000 Hertz. See 47 C.F.R. 54.101.

[20] Indiana Utility Regulatory Commission (2006).

[21] Ibid., 10 (emphasis in original).

of competition and market power in local telephone markets, and gives examples of state recognition of the importance of wireless and broadband in local telephone markets.

Section IV discusses ways of defining local telephone markets for analytical purposes and proposes methods for including competition from wireless and broadband platforms in state analyses. Section IV also discusses several methods proposed by the New York State Department of Public Service that include wireless and broadband in measures of local telephone competition and market power.

II. Competition, Market Power, and Measurement

The performance of a market – i.e., the extent to which the interaction of producers and consumers results in an efficient allocation of resources, an equitable distribution of income or wealth, and incentives for innovation and risk taking – is of concern to policy makers, including regulators. Markets that do not perform adequately are candidates for policy interventions such as application of antitrust policy, or regulation of entry, price and quality. The structure of the market and the extent to which it is or is not competitive is an important factor in determining whether a market is likely to produce acceptable results or require policy intervention. This Section II introduces the concepts of market structure, market power, and measures or indicators of market power. Readers already familiar with this material may find it useful to skip it and go to Section III, which discusses the effect of wireless and broadband technologies on local telecommunications.

A. Competitive, monopoly, oligopoly, and monopolistically competitive markets

1. The concept of the market

The concept of a market, though central to many discussions of regulatory policy, is often undefined. A market may be defined differently depending on who is using the term for what purpose. Economists drawing classroom supply and demand diagrams define a market as a mechanism for price determination, or as a locus of exchange within which buyers and sellers interact to determine the price of a good or service. The economist's market encompasses all participants whose actions affect price; within this market the "law of one price" holds because arbitrage will not allow the same good to sell at multiple prices in a well defined market. This market may have a physical existence, but it need not do so.

Antitrust courts and enforcement agencies often use the term "market" to refer to the product and geographic space within which a hypothetical monopolist or cartel could raise price above the competitive level for a significant time without causing defections by buyers (demand response) or entry by other suppliers (supply response) – either of which would make the price increase unprofitable. Business firms may use the term "market" in a looser sense to mean the area in which they sell their products or to refer to the industry or sector to which they belong.[22] These uses of the term "market" will generally not lead to the same operational definition of market boundaries. In addition, regulators may wish to define the market in a manner that suits their specific needs. For example, in assessing the structure of wireless (commercial mobile radio services or CMRS) markets, the FCC uses "economic areas" (EAs) as defined by the U.S. Department of Commerce's Bureau of Economic Analysis. Each of the 172 EAs that cover the

[22] See, for example, the discussion in Geroski (1998). The economist's abstract conceptualization of a market goes back at least as far as Cournot (1838, 51-52), who wrote:

> … by *market* economists mean, not a certain place where purchases and sales are carried on, but the entire territory of which the parts are so united by the relations of unrestricted commerce that prices there take the same level throughout, with ease and rapidity. [Emphasis in original]

50 states is an aggregation of counties associated with an economic node within which people typically work and live.[23]

Markets may be characterized in terms of their structure and the way buyers and sellers interact with one another. It is common to classify markets in terms of the number of sellers that participate in the market: a competitive market has many sellers; an oligopoly market has a few sellers; and a monopoly market has one seller.

2. Classifying markets

a. Competitive markets

In competitive markets, multiple sellers and buyers (none of whom believes that they are able to affect price) interact to determine the price and quantity of a homogeneous product. In the aggregate, buyers' and sellers' actions determine the price of the product; individually, however, buyers and sellers in competitive markets are price takers. Other requirements of competitive markets are that buyers and sellers have information regarding prices and quantities offered by other market participants and that there is easy (i.e., low-cost, fast) entry into and exit from the market. In competitive markets, price will tend toward the marginal cost of production. Given easy entry and exit, firms will enter the market if expected returns are higher than their cost of capital, and they will leave if expected returns are lower than their cost of capital. The price and quantity results of a competitive market are said to be allocatively efficient – the price that consumers pay equals the marginal cost of output.[24] The price equals marginal cost (or P = MC) standard is sometimes used as a normative benchmark to assess the extent to which real markets approach the competitive ideal in terms of allocative efficiency. Another characteristic of competitive markets is atomistic competition or anonymous rivalry. Because they do not believe that the actions of other producers influence the price they will receive, firms in competitive markets are not active rivals.[25] Few, if any, markets can be classified as fully or perfectly competitive. However, many markets are considered to be "workably competitive."[26] One justification for government policies such as antitrust enforcement and regulation is that some markets, if left by themselves, would deviate too far from the competitive ideal and result in inefficiency and, possibly, an inequitable distribution of income.

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[23] FCC (2002), § II.A.1.b.(ii).

[24] Allocative efficiency also requires that there are no unpriced externalities (i.e., third-party effects) in consumption or production.

[25] Neighboring wheat farmers embody the idea of anonymous rivalry. Though they participate in the same market and are, thus, competitors, they most likely do not consider themselves rivals. In fact they may share equipment and come to each other's aid when needed.

[26] For discussion of workable competition as it applies to telecommunications, see Chessler (1997).

b. Monopoly markets

A monopoly market has only one seller. That single seller does not take the market price as a given; instead, it determines the price/output combination that maximizes its profits, and it must take into account that to sell more it must lower price. Without competing sellers, a monopolist will tend to set price above marginal cost.[27] This results in an inefficient allocation, since consumers are willing to pay more for the product than it would cost the firm to produce. Nevertheless, the firm has no incentive to add to production, because doing so would force it to lower price and reduce its profits. Few markets are true monopolies; markets with one large seller and a number of smaller firms are termed "dominant-fringe" markets. In these markets, the dominant firm sets its price to maximize its profits, but it takes into consideration the behavior of a group of fringe firms, each of which acts as a competitor. The dominant-fringe model has been widely used in telecommunications: The FCC treated AT&T as a dominant firm in interstate long-distance markets for more than a decade after divestiture, and state commissions have treated ILECs have been treated as dominant firms in local exchange markets since passage of the 1996 Act.[28]

c. Oligopoly markets

Monopoly and competitive markets are the extremes on a continuum of market structures; oligopoly structures occupy a position between monopoly and competition. Though oligopoly markets have multiple sellers, the number is too small for the market to be considered competitive. Moreover, no single firm dominates the market, and each firm believes that its actions (and the reactions of its rivals) have an effect on price. Oligopoly markets are characterized by active rivalry – firms may compete in a variety of ways including the use of advertising and product differentiation. Oligopolies may behave differently if a very few firms control a substantial majority of the market in a "tight" oligopoly.[29]

d. Monopolistic competitive markets

Monopolistic competition is a hybrid of competition and monopoly. In competitive markets, many firms sell a homogeneous product, so each firm's product is a perfect substitute for every other firm's product; in monopoly markets, a single firm sells a product for which there are no close substitutes. In monopolistic competition, many firms sell products that are close, but not perfect, substitutes for each other's products. Firms engaged in monopolistic competition

[27] A monopolist's ability to maintain its price above marginal cost may be constrained by potential competitors that are not in the market but could quickly enter the market without incurring significant sunk costs, undercut the monopolist's price, capture a significant portion of the market, and exit if the monopolist lowers its own price. A monopolist facing a credible threat of entry might behave as if it were a competitor. See Baumol, Panzar, and Willig (1988).

[28] The dominant-fringe model is discussed in Rosenberg and Clements (2000), 18-28.

[29] Oligopoly models are discussed in Chessler (1997) and Rosenberg and Clements (2000).

engage in product differentiation such as varying features, style, quality, and branding. To the extent a firm creates the perception that its product differs from similar products, it will have market power, though its market power is limited by the availability of numerous imperfect substitutes.

3. Markets, market failure, resource allocation, and policy

Differences in market structures or in the degree of competitiveness exhibited in a market will lead to differences in the extent to which market outcomes are consistent with an efficient allocation of resources. If a competitive market is working properly, consumers and producers will be getting appropriate price signals in the sense that the price consumers pay for the product equals the marginal resource cost of an additional unit of output. Markets that are not competitive in structure, in which sufficient information is lacking, or in which production or consumption of the product results in unpriced externalities (i.e., third-party effects), are said to exhibit market failure.

Where market failure is sufficiently important, policy intervention is appropriate provided that it can improve the outcome without imposing excessive costs or resulting in other unintended and undesirable consequences.[30] Policy interventions such as antitrust enforcement with its structural and behavioral remedies, public utility regulation, and public ownership are aimed at improving outcomes relative to those achievable through market forces alone. Policy optimists believe that policy improves outcomes, pessimists believe otherwise.[31] When assessing the advisability or efficacy of policy intervention, fair comparisons involve those between imperfect market outcomes compared to the results of imperfect policies, including design and implementation flaws. Perfect markets should not be compared to imperfect policies, nor imperfect markets to perfect policies. As Kahn noted:

> The "central institutional issue of public utility regulation" remains … finding the best possible mix of inevitably imperfect regulation and inevitably imperfect competition.[32]

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[30] Just as markets may fail, so too may policy interventions fail to improve outcomes or even make things worse, resulting in "government failure." Winston (2006) finds many instances of government failure. Wolf (1993) is more sanguine though still cautious about the outcomes of policy interventions.

[31] For example, in considering monopoly, regulation, and public ownership, Milton Friedman (1962, at 28) wrote that

> When technical conditions make monopoly the natural outcome of competitive market forces, there are only three alternatives that seem available: private monopoly, public monopoly, or public regulation. All three are bad so we must choose among evils. …. I reluctantly conclude that, if tolerable, private monopoly may be the least of the evils.

[32] Kahn (1988), xxxvii (quote in original).

4. Market power and its measurement

A firm operating in a market that is not competitive can exercise some control over the price of its product. To the extent that it can do so, the firm has market power. Market power and the potential that it will be exercised to the detriment of consumers and possible competitors is a major part of the justification for public utility regulation.

a. Market Power

Formally, a firm has market power to the extent that it can raise the price of its product above the level that would obtain in competitive markets.[33] Landes and Posner define market power as:

> the ability of a firm (or group of firms, acting jointly) to raise prices above the competitive level without losing so many sales so rapidly that the price increase is unprofitable and must be rescinded.[34]

The prices of firms with market power may be compared to the price that would obtain in competitive markets. As noted above, in competitive markets, firms are price takers; they have no market power, and price tends towards the marginal cost of production. Concomitant with setting price above marginal cost, a firm that exercises market power would produce less than the efficient level of output.

Market power is more general than the specific term, monopoly power. A firm need not be a monopolist to have exercise market power, and a group of firms without individual market power may, through coordinated action, exercise market power. For an example of the former, see Apple Computer Company; for an example of the latter, see OPEC.

To the extent that price remains above marginal cost for a sustained period, resources are transferred from consumers to the producer, raising distributional (though not efficiency) concerns; in addition, setting price above marginal cost generally results in some "deadweight" loss,[35] with the amount of deadweight loss depending on the elasticity of demand and the firm's marginal cost function.

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[33] Another way of defining market power relates to the question of whether a firm can influence the market price by varying its output: A firm has market power if the market price rises when the firm decreases its output and falls when it increases its output. The more responsive market price is to changes in the firm's output, the greater the firm's market power. A firm that is neither a monopolist nor a dominant firm can have market power if demand is inelastic and other firms are unable to increase their output. See Wolak (2003).

[34] Landes and Posner (1981), 937.

[35] Deadweight loss measures the differences in consumer and producer surplus between the competitive (price = marginal cost) quantity and the quantity that results from using market power to price above that level.

However, whether market power is harmful from a societal perspective depends on perspective. In a static framework, market power is undesirable because it reduces total welfare. In a dynamic framework, market power – or the hope for obtaining it and the supra-normal profits it promises – provides incentives for risk-taking and innovation, leading to more rapid growth and greater welfare over time.[36] Market power is a matter of degree, existing on a continuum beginning at zero in perfectly competitive markets. Firms operating in markets that are not fully competitive have some market power and will tend to set price above marginal cost.[37] In addition, a firm with market power in one market might attempt to leverage that market power to obtain market power other markets. Leveraging is especially problematic when a firm has market power in a market for an intermediate input used by its competitors in end-user markets – a firm with market power in intermediate markets may create market power for itself in the end-user market by raising its rivals' costs.

b. Regulation and market power

A major goal of regulation is to keep a firm with market power from exercising it so as to harm consumers, harm actual or potential competitors, and impede normal market functioning. Regulation and antitrust policy are sometimes considered alternative policy approaches to achieving similar societal aims.[38] In discussing the goals of antitrust policy, at least economic efficiency goals stressed by economists, Pitofsky noted that they include

> to avoid the allocative inefficiencies of monopoly power, encourage efficiency and progressiveness in the use of resources, and perhaps, on fairness grounds, to maintain price close to cost in order to minimize unnecessary and undesirable accumulations of private wealth.[39]

Pitofsky added the observation that other, more political, considerations are also important:

> … [T]he fear that excessive concentration of economic power will foster antidemocratic political pressures, the desire to reduce the range of private discretion by a few in order to enhance individual freedom, and the fear that increased governmental intrusion will become necessary if the economy is

[36] This view follows from Schumpeter (1943). Policies such as patents and copyrights confer market power on innovative firms, but they are often viewed as necessary incentives for innovation, growth, and development.

[37] One measure of market power, the Lerner Index, measures market power in terms of the relative difference between price and marginal cost. See Section II.B.1.c below for discussion of the Lerner Index.

[38] Public ownership is another policy approach to the control of market power.

[39] Pitofsky (1979), 1051.

> dominated by the few, can and should be feasibly incorporated into the antitrust equation.[40]

Similarly, even a casual observer of the regulatory process notes that regulation also has broader goals than allocative efficiency. These broader goals, which are sometimes described as equity, distributional, fairness, justice, or social goals include promoting economic development and ensuring universal service.[41]

B. Measures or indicators of market power

Evidence of the existence of exercised market power includes both firm- and market-level indicators or measures. Firm-level indicators or measures use data gathered for a particular firm to assess whether that firm has market power. Firm-level measures include individual firm market shares, profit rates and the firm's Lerner Index. Market-level indicators or measures use structural or performance data for the market as a whole to assess whether market power has been exercised in a market or whether the market is susceptible to the exercise of market power. Market-level measures include the Hirschman-Herfindahl Index (HHI) and concentration ratios, market profit rates, and the market-level Lerner Index. Thorough analysis would include examination of both firm- and market-level indicators.

1. Firm-level measures

a. Market share

A firm's market share is calculated as the percent of the market controlled by a firm.[42] Market share data might be used as first-level indicator of the likelihood that a firm or firms possess market power, the rationale being that a firm that is "large" relative to the market (high market share) is more likely to have market power than a firm that is "small" relative to the market. However, it has been recognized that market share, by itself, may be an unreliable indicator of market power. Landes and Posner, in commenting on the use of market share analysis in antitrust analysis, wrote that:

> The standard method of proving market power in antitrust cases involves first defining a relevant market in which to compute the defendant's market share, next computing that share, and then deciding whether it is large enough to support an inference of the required degree of market power. Other evidence – for example, the defendant's profits, or the ability of new firms to enter the market, or of price

[40] Ibid., 1075.

[41] Zajac (1978 and 1995) discusses the relationship between efficiency and fairness in the context of public utility pricing and regulation.

[42] The size of the market might be based on number of customers served, revenues, or by units of output.

> discrimination may be presented to reinforce or refute the inference from market shares.[43]

Landes and Posner then went on to argue for the importance of factors other than market share (e.g., demand elasticity and the elasticity of supply of other firms) in determining market power.

As noted above, sometimes a firm with a large market share is considered to be a dominant firm and treated differently than its smaller fringe competitors. For example, since the 1996 Act opened local markets to competition, state regulators have treated ILECs as dominant firms. They have been under special obligations, including the duty to offer their competitors unbundled access to their network facilities and functions. Also, from divestiture[44] in 1984 until the mid-1990s, the FCC treated AT&T as a dominant firm in the interstate long-distance market.[45]

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[43] Landes and Posner (1981), 938.

[44] The term "divestiture" refers to a watershed event in the history of the telecommunications industry. In accordance with the 1982 consent decree between AT&T and the U.S. Department of Justice, AT&T divested itself of its local telephone properties (the Bell Operating Companies or BOCs). The BOCs were grouped into seven regional holding companies. Line of business restrictions in the consent decree enjoined AT&T from offering local telephone service and enjoined the BOCs from offering inter-LATA long distance and from manufacturing telephone equipment. The consent decree settled the government's 1974 antitrust action against AT&T and its manufacturing arm, Western Electric. The consent decree became known as the Modification of Final Judgment or MFJ, because it modified a 1956 consent decree between AT&T and the Department of Justice (that decree settled a 1949 antitrust complaint against AT&T). See *United States v. American Telephone and Telegraph* Co., 552 F. Supp. 131 (D.C. District, 1982).

[45] In October 1995, the FCC declared AT&T to be a non-dominant interexchange carrier. See FCC (1995). This declaration placed AT&T under the same regulatory rules with respect to tariff filings as other interexchange carriers (e.g., MCI and Sprint). In making this determination, the FCC found that, "while the domestic, interstate, long-distance market is not perfectly competitive, AT&T neither possesses nor can exercise individual market power within that market as a whole." See Ibid., ¶ 35.

By several measures, AT&T's market share in the long-distance market fell considerably between 1984 and 1995. In 1984, AT&T had a 90.1 percent market share (in terms of revenues) in the domestic U.S. long-distance market; by 1995, AT&T's share had fallen to 51.8 percent. See FCC (1998a), Table 10.9. In the fourth quarter of 1984, AT&T had a 80.2 percent share of interexchange access minutes; by 1995, AT&T's share had fallen to 55.5 percent. See FCC (1999), Table 1.1. Between June 1987 and December 1995, AT&T's share of presubscribed lines fell from 83.7 percent to 66.4 percent. See Zolnierek, Rangos, and Eisner (1999), Table 2.2.

In making this determination, the FCC evaluated factors including the relevant product and geographic market, AT&T's declining market share, the supply elasticity of the market, the demand elasticity of business and residential customers, AT&T's size and resources, and competitive indicators in several market segments.

b. Profit rates

Profit rates, measured in terms of rate or return on the firm's equity capital or rate of return on assets (total invested capital) have been used to infer the existence of market power. The line of reasoning is that firms with market power have incentives and ability to set and sustain prices above a competitive level; thus, they are likely to earn a return that is above the competitive, risk-adjusted level. Indeed, traditional cost-of-service or rate-of-return regulation aimed at determining the firm's cost of capital and setting prices so that the firm had an opportunity to earn a reasonable but not excessive return.

c. The Lerner Index

The Lerner Index is often used to measure a firm's market power.[46] It is defined by the formula $L_f = \frac{P_f - MC_f}{P_f}$ in which L_f is a measure of the market power of a firm; P_f measures the firm's profit-maximizing price (determined by the firm finding the combination of output and price at which its marginal revenue and marginal cost of output (MC_f) are equal). The Lerner Index is based on the view that a firm has market power to the extent that it can raise and sustain its price above the competitive level. Moreover, the larger the value of L_f, the greater the firm's market power.

Although calculation of the Lerner Index seems straightforward, in practice it is not always so. The firm's marginal cost might not be readily observable. Average costs and other accounting cost measures might lead to misleading results. This problem is exacerbated when the output level is not the profit-maximizing level, as would be the case when a firm faces price regulation.

i. The Lerner Index and elasticity

Although the Lerner Index is often stated in terms of the relative margin between price and marginal cost, an alternative way to calculate the Lerner Index is given by $L_f = \frac{1}{\varepsilon_f}$ where ε_f is the absolute value of the elasticity of demand for the firm's output.[47] Due to the difficulties in

[46] The original exposition of what has come to be called the Lerner Index may be found in Lerner (1934), 169.

[47] Elasticity of demand (sometimes own-price elasticity) is defined as the percentage change in quantity demanded of a product induced by a one percent change its price.

calculating the Lerner Index directly, the elasticity form may be easier to estimate. Nonetheless, the elasticity form is also subject to some difficulty including the requirement that it be estimated at the profit-maximizing price/quantity pair. Also, as noted below, estimation of demand elasticities is not without its own difficulties. In addition, market power is defined as the ability to raise and sustain price above the competitive level. A firm that has market power will set its price at the profit-maximizing level, and measured elasticity at that level may be much higher than it would if it measured at the competitive level.

ii. Factors underlying the Lerner Index and demand elasticity

Although the Lerner Index is a consistent measure of market power, it is, itself, a summary measure that subsumes several other basic determinants of market power, including the individual firm's market share, S_f, the market demand elasticity for the product, ε_M, and the supply elasticity of other firms that are in the market or could easily enter it, η. Under fairly general conditions, the effect of changes in these factors on ε_f and on L_f are as follows:[48]

Mathematically, elasticity of demand is defined as: $\varepsilon = \left(\frac{\partial Q}{\partial P}\right)\left(\frac{P}{Q}\right)$ along the demand curve for the firm's product. Holding other things such as income and the prices of other products constant, customers will tend to purchase less of a good or service as its price increases. Thus, $\frac{\partial Q}{\partial P}$ is generally negative, and ε will be a negative number. However, it is conventional in discussions to use the absolute value of ε_f. Economists divide elasticity into three regions: the inelastic region in which $|\varepsilon_f| < 1$, the elastic region in which $|\varepsilon_f| > 1$, and the unit elasticity region in which $|\varepsilon_f| = 1$. In the inelastic region, a price increase will increase the firm's revenues; in the elastic region, a price increase will decrease the firm's revenues; in the unit elastic region, a price increase will not affect the firm's revenues. It makes a difference whether ε_f = -.5, -1.0, -1.5, or -2. A firm is price constrained (has no market power) at its current price if $|\varepsilon_f|$ is sufficiently in excess of 1.0 such that the decrease in revenues induced by a price increase more than offsets the cost reduction resulting from decreased sales.

[48] One version of the elasticity of demand for an individual firm makes these dependencies clear:

$$L_f = \frac{P_f - MC_f}{P_f} = \frac{1}{\varepsilon_f}, \text{ and } \varepsilon_f = \frac{\varepsilon_M + (1 - S_f)\eta}{S_f}, \text{ so } L_f = \frac{S_f}{\varepsilon_M + (1 - S_f)\eta}.$$

The market elasticity, ε_M, and other firm's supply elasticity, η, can also be broken down in terms of their underlying determinants. The market elasticity of demand, ε_M, is determined by factors including the extent to which the product is considered to be essential, the closeness of substitute products, and the proportion of consumer income devoted to it. The elasticity of other firm's supply, η, depends on the characteristics of the production and cost functions of actual and

1. Increasing S_f will decrease ε_f and increase L_f – the larger the firm's market share, the greater its market power.

2. Increasing ε_M will increase ε_f and decrease L_f – the larger the market elasticity of demand for the firm's product, the lower its market power.

3. Increasing η will increase ε_f and decrease L_f – the greater the elasticity of supply of the firm's actual and potential competitors, the lower its market power.[49]

Moreover, elasticity measures – both demand and supply – tend to be higher when measured over longer time periods. Thus, market power is likely to be smaller when viewed from a long-run perspective than when viewed as a short-run phenomenon.

Other factors that affect ε_f include the degree of product differentiation in the market. When the output of different producers is considered largely indistinguishable by consumers, there is no product differentiation. Other things equal, ε_f will be less when there exists a greater the degree of product differentiation between the output of the various firms in the market.

If a firm is able to create a perception in consumers' minds that its products are in some sense different from other firms' products, it will have more market power. Firms spend enormous amounts on marketing and advertising to create brand loyalty (or brand-name capital) and the impression that that their products are different from competitors' offerings. Firms can differentiate their offerings by adding features or functionality lacking in other firms' offerings. Firms may attempt to differentiate their product from competing products by emphasizing their product's quality, reliability, customer service, or safety.

d. Estimating demand and supply elasticities

Econometric estimation of demand and supply elasticities is a common task undertaken by economists seeking to determine existence and extent of a firm's market power. However, such estimations are not without their difficulties. Reliable estimation of demand elasticities starts with proper specification of the demand relation for a firm's product. The demand elasticity of a firm's product cannot be determined from simply relating the firm's unit sales to its prices. Other factors must be considered, including the prices of substitutes and complements, household income levels, the number of households or population, and various other factors normally subsumed in the "other things equal" or *ceteris paribus* assumption. Estimation of the parameters of the demand relation requires a number of observations over time and/or across space. Moreover, if a long time series is used, possible changes in tastes must be accounted for in some manner. This is especially true when markets are characterized by

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potential competitors, whether there are significant barriers to entry into the market and exit from the market, and the prices of other products they might produce instead.

[49] Each of these comparative static results assumes that other factors (such as income and the prices of other products) are held constant.

diffusion and adoption of new technologies. Reliable estimation of supply elasticities also requires appropriate econometric techniques. For example, an analyst must have some means to determine or identify whether observed changes in prices and quantities result from shifts in demand, shifts in supply, or both. Finally, even the most carefully done elasticity estimates will still be mean estimates within a confidence interval.

2. Market-level measures

Market measures include the Hirschman-Herfindahl Index, concentration ratios, and the market-level profit rate and Lerner Index.

a. The Hirschman-Herfindahl Index (HHI)

The Hirschman-Herfindahl Index (HHI) measures the degree of market concentration. The HHI is calculated by summing the squares of the market shares of all the firms in the market.[50] Mathematically, $HHI = 3S_i^2$, where S_i is the i^{th} firm's market share. The HHI has a range such that $0 < HHI \leq 10{,}000$, where the firms' market shares are expressed as percentages. Though HHI can never attain a value of zero, the greater the number of firms in the market and the smaller their market shares, the closer HHI will be to zero. A market controlled by a monopolist would have a HHI value of 10,000 ($100^2 = 10{,}000$).

b. Concentration ratios

Concentration ratios, CR_N, measure the percent or proportion of the market controlled by the largest N firms in the market. For example $CR_4 = \sum_{i=1}^{4} S_i$, with individual firm market shares rank ordered from largest to smallest, measures the proportion of the market controlled by the four largest firms in the market. Similarly, CR_8 measures the proportion of the market controlled by the largest 8 firms. The rationale for use of concentration ratios is that when a few firms control a large proportion of the market, it is easier for them, individually or in concert, to exert market power.[51]

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[50] Though calculation of the HHI calls for the use of the market shares of all firms, the shares of small, fringe firms will have little influence on the HHI value if there are one (or several) firms with relatively large market shares. In this case, little qualitative information is lost if the shares of the smallest firms are not included in the HHI calculations. For example, if the ten smallest firms in a market each had one percent shares, their combined contribution to the HHI would be just ten points.

[51] A variation on the use of the N-firm concentration ratio is to determine how many firms ranked from largest to smallest control some critical percent of the market – 50 or 75 percent, for example. The greater the number of firms that control 50 or 75 percent of the market, the less concentrated the market.

c. Other market-level measures

Concentration ratios and the HHI represent two of many possible measures or indicators of industry or market concentration. An ideal concentration measure increases as the largest firms increase in size relative to the total size of the market. Both the CR_N and the HHI do this.

In addition, measures or indicators of possible market power at the market level include average profit (return on sales, return on assets, or return on equity) rates and average Lerner Index measures for firms in the market. Persistently high average profit rates in an industry or a high industry average Lerner Index might be interpreted as indicating that the industry as a whole is exploiting market power. However, absent significant barriers to entry (legal or otherwise) or anticompetitive behavior by industry participants (overt or tacit coordination), entry can be expected to reduce such market power over time. Moreover, industries characterized by high fixed costs will tend to have high measured Lerner Indexes, and industries characterized by high rates of innovation and technology change may tend to have high profit rates.[52]

C. Defining the market

The market must be explicitly defined before it can be analyzed to determine whether it is sufficiently competitive. Operationally, there must be a way to determine which buyers, which sellers, and which products are part of the market – and which are not. The 1997 *Horizontal Merger Guidelines*[53] adopted jointly by the U.S. Department of Justice (DOJ) and Federal Trade Commission (FTC) define the market as

> … a product or group of products and a geographic area in which it is produced or sold such that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future producer or seller of those products in that area likely would impose at least a "small but significant and nontransitory" increase in price, assuming the terms of sale of all other products are held constant. A relevant market is a group of products and a geographic area that is no bigger than necessary to satisfy this test.[54]

The market is consequently defined in both product and geographic space as being the smallest market in which a hypothetical monopolist could exercise market power.[55] The "small but significant and nontransitory increase in price" has come to be given the acronym, SSNIP. The DOJ/FTC *Guidelines* assume a price increase of five percent above the competitive level to

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[52] Evans and Schmalensee (2001).

[53] U.S. Department of Justice / Federal Trade Commission (DOJ/FTC) (1997).

[54] Ibid., §1.0.

[55] Ibid., §1.11 and §1.21.

specify the "small but significant" size component[56] and a time frame of two years to specify the "nontransitory" component of the price increase.[57] Therefore, the test for market power is whether a firm could raise its price to a level five percent above the competitive level and maintain that increase for a period of two years without the combination of demand and supply substitution rendering the price increase unprofitable, forcing the firm to rescind it.

In determining the boundaries of the market, DOJ and FTC may rely on information obtained from customers. In 2006, the Department of Justice and the Federal Trade Commission issued a *Commentary on the Horizontal Merger Guidelines*,[58] which notes:

> Customers typically are the best source, and in some cases they may be the only source, of critical information on the factors that govern their ability and willingness to substitute in the event of a price increase. The Agencies routinely solicit information from customers regarding their product and supplier selections. In selecting their suppliers, customers typically evaluate the alternatives available to them and can often provide the Agencies with information on their functional needs as well as on the cost and availability of substitutes. Customers also provide relevant information that they uniquely possess on how they choose products and suppliers. In some investigations, customers provide useful information on how they have responded to previous significant changes in circumstances.[59]

This does not mean that only customer responses are considered. The data necessary for empirical calculation of market power measures may be available and might be used. The *Commentary* adds that:

> In some investigations, the Agencies are able to explore consumer preferences with the aid of price and quantity data that allow econometric estimation of the relevant elasticities of demand.[60]

If econometric estimation is used to estimate demand elasticities, and the elasticity estimates are used to define the geographic and product boundaries of the market, among the quantities to be estimated are the cross price elasticities between the subject firm's output and the output of other firms. Firms whose products that have "high" positive cross price elasticities with the subject firm's product are in the market; those that do not are not in the market.[61]

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[56] Ibid., §1.11.

[57] Ibid., §3.2.

[58] DOJ/FTC (2006).

[59] Ibid., 10.

[60] Ibid.

[61] Cross price elasticity is similar to own price elasticity, except that the cross price elasticity measures the percentage effect on the demand for good X resulting from an increase in

D. Applying concentration measures

Notwithstanding the difficulties in drawing bright lines between market structures susceptible to or free from market power, market power, several standards have been adopted. These include the 1997 DOJ/FTC *Horizontal Merger Guidelines* and the European Union's 2004 *Guidelines on the Assessment of Horizontal Mergers*.[62] Although these standards were developed for the purpose of determining when to oppose or consider conditioning mergers, they provide guidance concerning market structures that allow firms to exercise market power. Thus, these standards might be adapted by regulators assessing the competitiveness of telecommunications markets: a market structure that would raise market power concerns in a merger environment might raise similar concerns for regulators. Moreover, as in the case of mergers, market structures that raise market power concerns might call for behavioral or structural remedies.

1. DOJ/FTC Horizontal Merger Guidelines

The DOJ/FTC *Horizontal Merger Guidelines* call for consideration of both the post-merger market concentration (measured in terms of the HHI) and the increase in concentration resulting from the merger.[63] The DOJ/FTC *Guidelines* presume that, other things equal, the higher the HHI, the more likely that a firm or group of firms will be able to exert market power, and that a significant increase in the HHI will make the exercise of market power more likely. Market power may be exercised unilaterally by a single firm or multilaterally through coordinated action of several firms. Coordinated action includes overt actions such as price fixing or collusion as well as tacit behaviors such as price leadership. In addition to considering the HHI concentration measure, the DOJ/FTC *Guidelines* provide for consideration of other factors that affect the likelihood that a merger will lead to market power being exercised to the detriment of consumers. These factors include the potential adverse competitive effects resulting from the merger, entry and exit conditions in the market, efficiencies that might result from the merger, and whether one of the merging firms is in danger of failing or exiting the market without the merger. Other factors include prior market conduct and the behavior of other firms

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the price of good Y. Mathematically, the cross price elasticity is defined by the expression: $\varepsilon_{XY} = \left(\frac{\partial Q_X}{\partial P_Y}\right)\left(\frac{P_Y}{Q_X}\right)$. For example, If $\varepsilon_{XY} = 1$, a one percent increase in the price of good Y would result in a one percent increase in the quantity of good X demanded. This result assumes that the price of good X did not change. Goods with positive cross price elasticities are considered substitutes. It must be noted that a high cross price elasticity, by itself, will not limit market power. If firm X is "small" relative to firm Y, sales diversion to X may be too few to make a price increase unprofitable. Nonetheless, a fully specified econometric analysis would include delineating market boundaries in terms of cross elasticities.

[62] European Union (2004).

[63] DOJ/FTC (1997), §1.51.

in the market. The HHI criterion is used as a rule of thumb or heuristic guide for further analysis; it is not, by itself, treated as a proof of market power.

a. Unconcentrated markets.

The DOJ/FTC *Guidelines* classify a market with a post-merger HHI below 1000 as "unconcentrated." In unconcentrated markets, mergers are unlikely to have adverse competitive effects and further analysis is ordinarily not required. No single firm in an unconcentrated market can have a share greater than 31.6 percent ($31.6^2 = 998.8$), ignoring all other firms in the market. A market with ten firms, each with ten percent of the market, would have an HHI of exactly 1000.

b. Moderately concentrated markets.

The DOJ/FTC *Guidelines* classify a market with a post-merger HHI between 1000 and 1800 would as "moderately concentrated." No single firm in a moderately concentrated market can have a market share in excess of 42.4 percent ($42.42^2 = 1799.4$), ignoring all other firms in the market. A market with five firms, each with 20 percent of the market would have an HHI of $5\times20^2 = 2000$ and would be classified as highly concentrated; a market with six firms, each with 16 ⅔ percent of the market, would have an HHI of $6\times(16\ ⅔)^2 = 1666$ and would be classified as moderately concentrated.

In moderately concentrated markets, mergers that result in an increase in the post-merger HHI of less than 100 points are considered unlikely to have adverse competitive consequences and ordinarily require no further analysis. Depending on other factors, mergers producing a post-merger increase of more than 100 points in the HHI may raise significant competitive concerns. The merger of two firms with individual market shares of seven percent would raise the overall HHI by 98 points and would not cause concern; the merger of two firms with individual market shares of ten percent would raise the overall HHI by 200 points and would cause concern.[64]

c. Highly concentrated markets

A market with a post-merger HHI above 1800 is classified as "highly concentrated." In highly concentrated markets, mergers that result in a post-merger increase of less than 50 points in the HHI are considered unlikely to have adverse competitive effects. A market in which any single firm has a 42.5 percent share would be highly concentrated ($42.5^2 = 1806$).

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[64] Independently, firms with X and Y percent of the market, respectively, contribute $X^2 + Y^2$ to the HHI. If they merge, the change in HHI equals $(X+Y)^2 – (X^2 + Y^2) = 2XY$. Thus, the merger of two firms with seven percent shares would raise the HHI by $2\times7\times7 = 98$, and the merger of two firms with ten percent shares would raise the HHI by $2\times10\times10 = 200$.

Depending on other factors, mergers resulting in a post-merger increase of more than 50 points in the HHI may raise significant competitive concerns. Although the presumption can be overcome by an affirmative showing that other factors limit market power, mergers that result in an HHI increase of more than 100 points in a market with post-merger HHI in excess of 1800 are presumed likely to create, enhance, or facilitate the exercise of market power. Thus, mergers involving two firms with individual market shares of five percent would not cause concern. However, in a market that is already highly concentrated, a merger of two firms with individual market shares of eight percent would be presumed to enhance or facilitate exercising market power.

d. DOJ/FTC Commentary on the Guidelines

The DOJ/FTC 2006 *Commentary* discusses the *Guidelines'* five-part organizational structure: market definition and measurement of concentration in the defined market, assessment of the potential adverse competitive effects of a merger, analysis of entry conditions, consideration of efficiencies created by a proposed merger, and consideration of failing and exiting assets. The *Commentary* notes that although this structure has become embedded in merger analysis, DOJ and FTC do not apply the structure in a linear, step-by-step progression that begins at market definition and ends at analysis of efficiencies and failing assets. Instead, DOJ and FTC use an integrated approach and can terminate review on finding, for example, that entry would be likely to offset the otherwise anticompetitive effects of a merger.[65] Furthermore, the *Commentary* notes that DOJ and FTC "do not make enforcement decisions solely on the basis of market shares and concentration, but both measures nevertheless play an important role in the analysis."[66]

2. The EU Guidelines

The European Competition Commission's *Guidelines* consider individual firm market shares as well as the market's post-merger HHI and changes in the HHI resulting from the merger. The EU *Guidelines* state that market shares of 50 percent or more may be evidence of the existence of a dominant market position. However, a large market share, by itself, may not be objectionable if there are smaller competitors that have the ability and incentive to increase their output and, thus, limit market power.[67] In discussing application of the HHI, the EU *Guidelines* state that horizontal competition concerns are unlikely in a market with a post-merger HHI below 1,000, in a market with a post-merger HHI between 1,000 and 2,000 and an HHI increase of less than 250 points, or a post-merger HHI above 2,000 and an HHI increase of less

[65] DOJ/FTC (2006), 2.

[66] Ibid., 15.

[67] European Union (2004), ¶ 17.

than 150 points.[68] On balance, the EU *Guidelines* are similar to though a bit less strict than the DOJ / FTC *Guidelines*.

E. Measuring market shares in the relevant market

Other things equal, indicators of market power will tend to be lower the smaller a firm's market share. The smaller the market in both product and geographic space, the greater the firm's market share is likely to be. Hence, firms facing allegations of market power will tend to favor expansive definitions of the market. Also, when considering the market power of an existing firm not subject to price regulation, it is essential to assume that the firm's existing price reflects whatever market power the firm has – i.e., that the firm has already set its price to maximize its profits. If the existing price is above the competitive level, products that would not be considered close substitutes at the competitive price may become so, and estimates of market power will be biased downward.

When calculating market shares for use in the HHI calculation, the DOJ/FTC *Guidelines* call for inclusion of not only actual current participants in the relevant product/geographic market but also firms that would be likely to enter the market in response to a SSNIP. Firms that would be likely to respond to a SSNIP by entering the market within one year without incurring significant sunk costs are classified as "uncommitted" entrants; their supply response would create new production or sales in the relevant market, and they could quickly terminate their production or sales in the relevant market without significant loss.[69] Thus, the capacity of some firms not actually in the market might be considered when measuring market shares. Firms that could enter the market within two years in response to a SSNIP but that incur significant sunk costs in doing so are termed "committed" entrants. Committed entrants' impact is considered in the analysis of entry, but they are neither counted as current market participants nor counted in the HHI calculation.[70]

Actual determination of market shares used to calculate the HHI uses the participants' (both current and uncommitted participants) estimated future sales (revenues or units) or capacity to serve the relevant market are used.[71] Note that only sales (dollars or units) and capacity available to the particular market under consideration be counted – the overall size of current or uncommitted potential entrants is not considered. However, when considering the effect of

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[68] Ibid., ¶ 19-20. The discussion includes some qualifying factors that might raise concerns about some mergers that do not result in otherwise unacceptable HHIs or increases in the HHI.

[69] DOJ/FTC (1997), §1.0.

[70] Ibid., §3.

[71] Ibid., §1.41.

potential entry, the resources available to current market participants as well as uncommitted and committed entrants may be considered.

When making a determining of market power in a particular market, only that product and geographic space should be considered. Unless it has market power in market vertically related to the one in question, the firm's market power or lack thereof in other markets does not matter.

F. Assessing customer response to price increases

The question of the extent to which buyers have acceptable substitutes for a firm's product are central to the evaluation of a market's competitiveness; a firm whose customers have multiple options that are close in function and price to its product will have little, if any, market power. In considering the likely buyer response to a SSNIP, the DOJ/FTC *Guidelines* require consideration of information on consumer behavior, including information on the following: whether and to what extent buyers have shifted or have considered shifting purchases between products in response to relative changes in price or other competitive variables; whether and to what extent sellers base business decisions on the prospect of buyer substitution in response to relative changes in price or other competitive variables; and the effect of timing and switching costs on consumer decisions.[72] For example, customers may be reluctant to switch to another provider if they have complementary equipment that works only with their existing supplier's product or if there are significant exit costs resulting from long-term contracts with the existing supplier.[73]

G. A look ahead: using market power concepts to understand local telephone competition

Section II has discussed the concept of a market, market power, market classification, measures or indicators of market power, market definition, and ways in which markets have been defined and concentration measures applied to assess whether market power might be a problem. Section III discusses state analyses of local telephone competition, technological convergence, and the effect of convergence on substitution of wireless and broadband services for local wireline telephone service. Section III also provides examples of state recognition of the importance of wireless and broadband substitution in local telephone markets.

[72] Ibid., §1.11.

[73] At least some of these conditions are present in the wireless telephone market.

III. Convergence and State Analyses of Local Telephone Competition

Preceding sections have discussed competition local competition under the Telecommunications Act of 1996, market structures, and market power and its measurement. Section II explained that the competitiveness of a market depends on the availability of reasonable alternatives or substitutes for the relevant product. The source of alternatives is largely immaterial to consumers. This Section III now discusses convergence, the effect of convergence on substitutability and competition in local telephone markets, and explains that as wireless and broadband services have become more widely deployed and more heavily used, they have become increasingly competitive platforms or technologies that alter the landscape of local telecommunications. In this Section, we also provide examples of how states have recognized the importance of wireless and broadband technologies in competitive analyses. In addition to the state recognitions of the importance of wireless and broadband in making market power determinations, the New York Department State of Public Service has developed several approaches for including wireless and broadband in their analyses. Those approaches, along with our recommendations, are discussed in Section IV.

A. Convergence

Convergence can have several meanings. *Technological convergence* allows one technology or platform to serve different ends. Examples include using a single transmission facility (fiber optic cable, coaxial cable, copper wire, or airwaves) to deliver multiple services – voice, data, and video (the "triple play"). *Functional convergence* allows different technologies to satisfy a single end. Examples include using wireline and wireless networks to carry voice and/or data traffic and using cable modems, DSL lines, broadband over power lines (BPL), or wireless networks to deliver broadband service.[74]

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[74] Cable modems are offered by cable television system operators (CSOs). They provide a broadband data connection that can be used for high-speed internet access. Cable modems can also be used to provide VoIP service offered by the CSO or to access applications-based VoIP services such as Vonage.

DSL refers to "digital subscriber line" service. DSL service can be provided over the twisted pairs of copper lines (the local loop) that provide voice-grade telephone service. DSL is sometimes called "xDSL" in which the "x" may denote a particular type or speed of DSL, with "A" denoting an asymmetric service (slower upload than download speeds), "H" for high-speed, "S" for symmetric, "V" for very high speed, etc. DSL service makes use of the high-frequency part of the spectrum available on the local loop to provide a digital broadband data service that allows subscribers to obtain high-speed internet access. ADSL service does not interfere with voice-grade service, and both can be delivered simultaneously over the same local loop. DSL service is offered by an ILEC or by a CLEC or internet service provider (ISP) that has leased an unbundled local loop from the ILEC. For a customer that uses both traditional wireline telephone service and DSL service, broadband traffic is separated electronically from voice traffic at the customer premises and at the central office. If a customer is allowed to purchase "naked" DSL service (a broadband connection unbundled from voice-grade telephone service), that customer may choose to use VoIP service and drop wireline voice service.

Market convergence combines formerly disparate markets in which firms that did not previously compete directly now do so. For example, the formerly separate banking, insurance, and investment industries are now all part of a converged financial services industry, and increasingly analysts refer to a converged information and communications technology, or ICT, industry in which telephone companies offer data and entertainment service and cable systems offer telephone service. Neuchterlein and Weiser define convergence as "the coalescence of different types of communications services, traditionally offered over distinct transmission platforms, into mere applications riding on top of largely interchangeable transmission platforms."[75] By eliminating restrictions on what services particular firms could offer, the Telecommunications Act of 1996 was intended to enable market convergence.

Physical convergence allows a single device or product to serve several often unrelated functions. Examples include the multi-function Swiss Army knives, clock radios, camera phones, music player phones, the fax/copier/scanner, and handheld computer/PDA/phones. In the communications sector, Microsoft has announced that it will include voice over internet protocol (VoIP) capability in new versions of its business software.[76]

Convergence can result from technological shift and/or a change in regulation or policy that allows convergence to occur. The uses of wireless and broadband technologies in telecommunications are examples of convergence. Telecommunications has been affected both by the technological shift allowed by digital technology and by the policy shift embodied in the Telecommunications Act of 1996. Though policy enabled convergence, technology was the driving force: without technological advances, competitive forces would not have been created that led to pressure for policy change.

Another example of convergence is combining telephone numbers with Internet protocol (IP) addresses in NeuStar's ENUM plan. Going forward, ENUM or similar plans will facilitate

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BPL or broadband over power lines delivers a broadband connection to consumers over the electric distribution grid. Though not, as yet, widely deployed, BPL may provide consumers with a third choice for wired broadband service. See Bode and Wilt (2004) and NARUC (2006) for discussion of BPL.

Wireless broadband can also be delivered using one of several wireless technologies. Traditional wireless providers such as AT&T, Nextel, Sprint, and Verizon offer wireless broadband service; in addition wireless internet service providers (WISPs) such as Clearwire® offer their own form of wireless broadband access.

For comparison of some of the technologies available for broadband access, see Newman (2005).

[75] Neuchterlein and Weisser (2005), xvii.

[76] Stern (2007).

interconnection of VoIP providers and the PSTN.[77] ENUM allows translation of telephone number into universal identifiers that can be used in many devices and applications (voice, fax, mobile, email, text messaging, location-based services and the Internet).[78]

Convergence in telecommunications gives many consumers access to multiple technologies or platforms that can be used to send and receive voice communications. Consumers are no longer limited to wireline platforms: they can choose from a range of platforms, including wireless and broadband. As wireless and broadband technologies have become more widely available to and used by consumers, they have increasingly become part of the competitive continuum. As more consumers view and use wireless and broadband services as substitutes for wireline services, the extent to which wireline and broadband services are competitive with wireline services will increase. The next subsection discussed the increasing availability and use of wireless and broadband technologies and their increasing substitutability for wireline services.

B. Technology substitution and competition in local telephone markets

When wireless and broadband deployment and usage were at much lower levels than they are today, they had little competitive effect on the demand for and use of wireline telephone service. At present, however, it is difficult to look at what has happened in the wireline,

[77] PSTN refers to the public switched telephone network. The PSTN is the world-wide voice network accessible to all users with a telephone. User addresses on the PSTN are based on national and international telephone numbers. Though historically the PSTN relied on analog circuit switched technology it is increasingly based on digital and packet or internet protocol (IP) technology. Analog transmission uses a continuous electrical signal that varies in amplitude or frequency in response to changes in the signal input. Circuit switched technology assigns a dedicated circuit or transmission path to each call for the duration of the call. Digital transmission represents the information flow as a series of ones and zeros. Packet technology puts a certain number of these ones and zeros into a discrete packet, which is then sent individually (along with address information) to its destination. Packets are then routed in the most efficient manner. Different packets may take different routes until they reach their destination and are reassembled in the correct order. Packet networks do not assign a circuit or capacity to a call; instead, packets are sent individually. Packet transmission allows more efficient use of the network, since no capacity is needed for the "dead" spots in the conversation or data transmission. Compare the efficiency of Internet access via dialup modem and via a DSL connection. When the Internet is accessed via a dialup modem, switch capacity is assigned to the call even though there may be no active transmission on the line, and that capacity is not available to other users. In contrast, when the Internet is accessed via a DSL line, the traffic does not go through the PSTN voice switch; rather, it is taken off the PSTN and put on a packet network that assigns capacity only when the user is actively sending or receiving data, any unused capacity may be assigned to other users.

[78] NeuStar, *ENUM*.

wireless, and broadband segments and not conclude that considerable substitution has taken place.[79]

1. The growth of wireless and broadband

First, several national measures indicate that consumer use of the traditional wireline network is in decline:

1. Wireline connections peaked at 192.4 million in December 2000 and have declined to a recently reported 172 million in June 2006: 142.2 million of these were served by ILECs, and 29.8 million were served by CLECs.[80]

2. Usage of the traditional wireline network is also declining: between 2000 and 2005, ILEC interstate switched access minutes declined by 29 percent (from 566.9 billion to 400.9 billion and continued to decline during 2006.[81] Moreover, between 1999 and 2005, the number of local calls carried by large ILECs reporting to the FCC declined from 554 billion to 336 billion, a decline of 39 percent.[82]

Second, wireless and broadband are becoming increasingly important to consumers and are, by far, the fastest growing segments of telecommunications. Wireless telephony has become both more extensive and more intensive, and there is increasing evidence of wireless substitution:

1. Between June 2000 and June 2006, wireless subscriptions increased 140 percent between – from 90.6 million to 217.4 million.[83]

2. Between December 2000 and December 2005, average wireless minutes of use increased 190 percent – from 255 to 740 minutes per month.[84]

3. The growth of wireless has required the FCC to revise the way it measures telephone subscribership to make allowance for the "increasing number of wireless only households."[85]

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[79] Loomis and Swann (2005) used state-level data for 1999 to 2002 to conclude that ILECs lose 5 lines for each 100 additional wireless subscriptions.

[80] FCC (2007a), Table 1.

[81] FCC (2007c), Table 10.1.

[82] Ibid., Table 10.2.

[83] FCC (2007a), Table 14.

[84] FCC (2007c), Table 11.3.

4. A May 2007 report by the National Center for Health Statistics[86] based on the National Health Interview Survey (NHIS) of over 13 thousand households notes:

> Preliminary results from the July-December 2006 indicate that [d]uring the last 6 months of 2006, [15.8 percent of American homes] did not have a landline telephone. Of those homes without a landline telephone, most had at least one working wireless telephone. Preliminary results from NHIS suggest that [at least 12.8 percent] had only wireless telephones during the second half of 2006.[87]

> Moreover, preliminary NHIS results indicate that renters and younger adults are more likely to be wireless-only. Over one quarter of renters and adults under thirty are in wireless-only households. In contrast, only 1.9% of adults over sixty five lived in wireless-only households.[88]

It is worth noting that the number of wireline loops and wireline usage generally grew until 2000, even though wireless subscriptions and usage were growing faster. After 2000, however, the number of wireline loops began to fall, as did interstate access minutes (a measure of wireline long distance usage). The number of local calls (a measure of local usage) peaked in 1999 and has declined steadily since then. Thus, the decline in the number of wireline loops and in wireline usage generally began at about the time that the number of wireless subscribers passed the 100 million mark, which it did between June and December 2000.[89] It remains to be determined whether 100 million wireless subscribers represented some form of "tipping point" with respect to the relationship between wireline and wireless service.[90]

The broadband segment has also shown rapid growth:

1. The proportion of U.S. households with internet access (not all of which is broadband) increased from 41.5 percent to 54.6 percent between August 2000 and October 2003; during the same period, the proportion of households with high-speed internet access increased from 4.4 percent to 19.9 percent.[91]

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[85] Belinfante (2007), 2, n.3.

[86] Blumberg and Luke (2007).

[87] Ibid., 1.

[88] Ibid., 2.

[89] FCC (2000c), Table 7.4, Table 10.1, Table 11.3 and Federal State Joint Board on Universal Service (2006), Table 8.3.

[90] The notion of tipping points in technology adoption is discussed in Gladwell (2002).

[91] FCC (2007c), Chart 2.10 and Table 2.9.

2. Residential advanced service lines (broadband connections capable of bi-directional transmission at a rate of 200 kbps) increased from 3.2 million in June 2000 to 50.3 million in June 2006. Moreover, the number of these lines increased by over 30 percent between June 2005 and June 2006.[92]

The significance of increased broadband penetration is that each household or business with a broadband connection is a potential user of broadband telephone service (VoIP), and the importance of VoIP as a substitute and competitive service grows with each broadband connection.[93]

2. Technology substitution and competition in local telecommunications

Wireless and broadband technologies are transformative in the sense that they are capable of altering the way people use telecommunications and redefining the market. Consumers do not want a telephone; rather, they want to be able to communicate with others. Whatever devices and networks best fill that need will win their business. Wireless and broadband technologies deliver services with different sets of characteristics than traditional wireline service. Wireless service makes communications specific to the individual rather than to a location; it provides connectivity any place, any time – 24/7. Broadband service, besides fulfilling Cairncross' "death of distance" prediction,[94] offers features and customization options that are presently unavailable on traditional wireline networks. Additionally, wireless broadband is available either through wireless providers or through Wi-Fi hotspots, and WiMAX, the next generation of wireless broadband with increased range and capacity, will facilitate convergence of broadband and wireless access, thus posing a competitive challenge for existing wireless service providers as well as for wireline providers.

Wireless and broadband technologies, individually and in concert, have the potential to change telecommunications as much as the advent the personal computer changed the computer market or the advent of digital cameras changed photography.[95] Furthermore, the world is alive

[92] FCC (2007b), Table 3.

[93] Growth of wireless and broadband does not, by itself, imply that consumers are substituting them for wireline service. Nonetheless, the growth of other platforms at a time when the wireline platform is experiencing decline in connections and usage, supports the hypothesis that some substitution is taking place.

[94] Cairncross (2001).

[95] It is too early to determine the effect on growth of VoIP resulting from Verizon's patent infringement suit against Vonage, the leading application-based VoIP provider. Verizon alleged – and a U.S. District Court has found – that Vonage infringed on Verizon's patents on the way traffic is exchanged between IP and traditional wireline telephone networks.

with technologically savvy and entrepreneurial people interested in finding ways to exploiting wireless, broadband, and wireless broadband.[96]

One segment of the market that is especially sensitive to technological substitution is the market for new service established by individuals who move. When they move, households face a discrete decision in choosing the type of telephone service they will use. Recent survey results have been reported indicating that 49 percent of recent movers abandoned traditional wireline telephone service:

> Of those who moved within the last year, 51 percent stayed with an old-school landline carrier, compared with 73 percent of those who had not moved recently. While only 9 percent of those who hadn't moved were using a mobile wireless carrier as their sole phone service, a surprising 25 percent of recent movers fell into that category.
>
> Other popular nontraditional phone services among recent movers included a cable provider's phone options (13 percent), other VoIP providers (6 percent), and "other" (5 percent). Comparatively, those who had not moved recently used those same services at 10 percent, 4 percent, and 4 percent respectively.[97]

Wireless and broadband technologies are becoming increasingly substitutable for wireline services. To the extent that they are increasingly substitutable, they are also increasingly competitive with wireline services. Thus, failing to include them explicitly in analyses of competition and market power in local telecommunications markets will lead to misleading results and, possibly, to policy decisions that are not based on actual market conditions.

C. State analyses of the effect of wireless and broadband on local telephone competition

In its simplest form, the local telephone market is a market in which consumers purchase the ability to place and receive local telephone calls.[98] Local calls or local traffic do not incur toll

[96] See, for example, the presentation of M2Z Networks, Inc. to NARUC's Ad Hoc Telecom call, April 13, 2007. M2Z proposes to deliver a mix of free and premium wireless broadband services to 95 percent of the U.S. population. In addition, Broadband in Gas (BiG) has been proposed. BiG is an ultra wideband broadband platform using broad-spectrum propagation inside existing natural gas lines. BiG and Broadband Over Power Lines (BPL) may provide alternatives to DSL and cable modems. For a description of BiG technology, see Nunally (2006). For more on BPL, see Bode and Wilt (2004) and NARUC (2006).

[97] Cheng (2007), reporting the results of a survey of seven thousand households conducted by Telphia.

[98] Local telephone service also includes a number of other functions such as the ability to access the toll or long-distance network of the customer's choosing. See note 1, above. .

charges; they originate and terminate within a customer's designated geographic local calling area. The Telecommunications Act of 1996 opened local telephone markets to competition. Subsequently, many states performed analyses of the competitiveness of their local telephone markets.[99] Competitive analyses are useful for several purposes:[100]

1. To provide information to legislatures contemplating deregulatory legislation;

2. To monitor competitive conditions for purposes of developing and implementing appropriate policy as market conditions change;

   This includes adjusting price-cap regulation to reflect changes in competitive conditions, moving away from dominant-firm models of regulation, determining appropriate treatment of new players, and adjusting unbundling rules as market conditions evolve;

3. To assess whether a horizontal, vertical, or conglomerate merger would create unacceptable levels of market power in local markets.

Until recently, most state analyses of competitive conditions in local telephone markets considered the impact of competition only from other wireline providers, whether facilities-based, via resale, or via UNEs. For example, as of 2003, fewer than half the states that had done a competitive analysis considered the effect of wireless or cable-based service, and only six states had considered IP telephony or VoIP in their analysis.[101]

Several reasons may be advanced for the lack of emphasis on wireless and broadband as competitive forces in basic telephone service markets, at least as of 2003. First, a major focus of the 1996 Act was to enable competition from CLECs and from CSOs to provide traditional wireline local service, so state commissions were legitimately concerned with the progress and sustainability of that form of competition. Second, wireless service was considered to be mostly supplementary or complementary to wireline service rather than as being competitive to or capable of supplanting wireline service for many households.[102] Third, broadband-based, voice over internet protocol (VoIP) service was a nascent technology that did not appear to pose an

[99] By 2003, nearly three quarters of states either had analyzed competitive conditions in the state or were in the process or planning to do so. Rosenberg and Lee (2003), Table 1.

[100] Rosenberg and Lee (2003), Table 4.

[101] Rosenberg and Lee (2003), Table 6.

[102] As noted above, it was not until after 2000 (when the number of wireless subscriptions passed 100 million) that the decline in wireline loops and usage became noticeable.

imminent or major threat to traditional wireline service or providers.[103] Fourth, wireless and broadband services are not regulated by the states, so data collection is more difficult.[104]

[103] As noted above, in June 2000 there were only 3.2 million residential advanced service lines capable of bi-directional broadband transmission.

[104] State authority over wireless is limited. Section 332 of the Communications Act of 1934 (as amended) states:

> … [N]o State or local government shall have any authority to regulate the entry of or the rates charged by any commercial mobile service or any private mobile service, except that this paragraph shall not prohibit a State from regulating the other terms and conditions of commercial mobile services. Nothing in this subparagraph shall exempt providers of commercial mobile services (where such services are a substitute for land line telephone exchange service for a substantial portion of the communications within such State) from requirements imposed by a State commission on all providers of telecommunications services necessary to ensure the universal availability of telecommunications service at affordable rates. [47 U.S.C. 332 (c)(3)(A).]

Though the FCC assigns wireless frequencies, wireless rates are not regulated. However, some states have used the "other terms and conditions" provision to consider wireless issues including service quality and contract terms such as early termination fees and cancellation periods.

With respect to broadband services, states were preempted by a 2004 FCC order that preempted a Minnesota Public Utilities Commission from imposing regulatory requirements applicable to providers of telephone service on Vonage's Digital Voice (VoIP) service. The FCC concluded that Vonage's VoIP service:

> … cannot be separated into interstate and intrastate communications for compliance with Minnesota's requirements without negating valid federal policies and rules. … [The FCC], not the state commissions, has the responsibility and obligation to decide whether certain regulations apply to [Vonage's] DigitalVoice and other IP-enabled services having the same capabilities. For such services, comparable regulations of other states must likewise yield to important federal objectives. Similarly, to the extent that other VoIP services are not the same as Vonage's but share similar basic characteristics, we believe it highly unlikely that the [FCC] would fail to preempt state regulation of those services to the same extent. …. We expect, however, that … states will continue to play their vital role in protecting consumers from fraud, enforcing fair business practices, for example, in advertising and billing, and generally responding to consumer inquiries and complaints. [FCC (2004), ¶ 1.]

In preempting the Minnesota PUC, the FCC relied on both the 1996 Act's statement that:

In the past few years, however, several states' competitive analyses have acknowledged the increasing importance of wireless and broadband competition. The following discussion presents excerpts from a few recent state studies. States are keenly aware of the increasing competitiveness of wireless and broadband services, and they are also aware of both the difficulties encountered in including wireless and broadband and the potential problems resulting from excluding them in their analyses.[105]

The Florida Public Service Commission's (FPSC) 2006 *Report on the Status of Competition in the Telecommunications Industry*[106] took considerable notice of intermodal competition from wireless and broadband providers. The report notes "the increasing acceptance of intermodal competitors, especially wireless and Voice over Internet Protocol (VoIP) service providers, as adequate substitutes for wireline telecommunications service by the consuming public."[107] The FPSC also noted that, because wireless, VoIP, and broadband services are not subject to its jurisdiction, its ability to gather data on these services is limited.[108, 109] The FPSC noted that Internet Protocol (IP) technology might assist CLEC competition because a

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> It is the policy of the United States - to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation. [47 U.S.C. § 230(b)(2).]

and on the "impossibility of separating Vonage's DigitalVoice service into interstate and intrastate components for purposes of complying with the Minnesota regulations without negating federal policies and directly conflicting with [FCC] regulations." FCC (2004), ¶ 15.

The FCC's 2004 order preempting the Minnesota PUC has been upheld on appeal. However, the court did not consider the issue raised by the New York Public Service Commission – whether the FCC could preempt state regulation of fixed, point-to-point VoIP service (for which separation into interstate and intrastate would be easier). The court noted that preemption of state regulation of fixed, point-to-point VoIP service was not ripe for review because the FCC had not ruled on that matter. See *Minnesota Public Utilities Commission v. FCC*, U.S. Court of Appeals for the Eighth District, Case No. 05-1069, Opinion filed March 21, 2007. 2007 U.S. App. LEXIS 6448. Available at: http://www.ca8.uscourts.gov/opndir/07/03/051069P.pdf .

Also, some state deregulatory or regulatory reform legislation removed broadband services from state commission jurisdiction. See Rosenberg and McGarvey (2005).

[105] In addition to the studies noted below, the Illinois Commerce Commission and the Indiana Utility Regulatory Commission were quoted in Section I.

[106] Florida Public Service Commission, 2006.

[107] Ibid., 2.

[108] Ibid.

[109] Ibid., 8.

softswitch[110] can be installed more cheaply than a conventional digital switch. In assessing wireless competition, the FPSC noted that, although the increasing number of wireless-only households might appear to be worrisome for the ILECs, the two largest wireless providers, Cingular and Verizon Wireless, are owned by ILECs.[111] In summary, based, in part, on the steady decline in the total number of residential access lines in Florida while the number of households has increased, the FPSC stated that "it appears that a growing number of Florida households may have substituted wireless service and, to a lesser degree, VoIP services for wireline services."[112]

The Iowa Utilities Board's (IUB) *Second Statewide Telecommunications Competition Survey for Retail Local Voice Services in Iowa* presents the results of an exchange-level study.[113] The IUB notes wireless substitution, increasing rollout of cable telephony, growth of VoIP, and BPL in experimental stages.[114] However, the IUB notes that growth of wireless service does not necessarily lead directly to substitution of wireless for wireline service, because "[f]or a rural state like Iowa, the substitution of wireless for wireline may be less than national studies suggest. This is because quality of wireless reception could be lower in rural areas where, presumably, there are fewer cell towers."[115] The IUB also noted the difficulty in gathering information regarding the extent of VoIP penetration and noted specific problems including the fact that "there have been no blocks of numbers directly assigned to any VoIP provider. Thus, it is nearly impossible to track the telephone numbers used for VoIP service, because they show up in the NRUF data as assigned to another carrier."[116]

The Public Utility Commission of Texas's (PUCT) *Scope of Competition in Telecommunications Markets in Texas*[117] found that intermodal competition, especially from wireless, was changing the way consumers viewed telephone service. When Texas consumers

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[110] A "softswitch" or "media gateway" relies on software rather than hardware to perform switching functions. Softswitches provide the bridge between networks that use different protocols. The public switched telephone network (PSTN) uses signaling system seven (SS7) and VoIP networks use the Internet Protocol (IP). See Newton (2006).

[111] Ibid., 19.

[112] Ibid., 69-70.

[113] Iowa Utility Board (2006). An "exchange" is a telephone switching center; the unit of analysis of an exchange-level study is the area served by a switching center.

[114] Ibid., v – vii.

[115] Ibid., 18.

[116] Ibid., 21. NRUF is the Numbering Resource Utilization/Forecast Report, which carriers controlling telephone numbers file with the NeuStar, the North American Numbering Plan Administrator (NANPA). See http://www.nanpa.com/nruf/index.html .

[117] Public Utility Commission of Texas (2007).

identified whom they viewed as their voice telecommunications provider, ILECs had a 73 percent market share, primary-use mobile wireless accounted for 14 percent,[118] CLECs accounted for 9 percent, and cable and VoIP accounted for 4 percent.[119] The PUCT recognized the importance of alternative platforms in assessing competitiveness, noting: "The new telecommunications arena primarily features competition among the ILECs, cable companies, mobile wireless companies, and non-facilities based companies such as Vonage. Traditional competitive local exchange carriers (CLECs) remain, but with a diminishing market share."[120] Considering only those wireless phones that were used to replace wireline phones, the PUCT determined that "as of June 2006 … mobile wireless companies have already passed the CLECs for 'primary-use lines'… "[121] Moreover, as further evidence of competitive activity, the PUCT noted that ILECs are offering promotions to "winback" customers lost to cable and VoIP providers.[122]

D. The importance of state commission analyses of wireless and broadband competition in local telephone markets

It is important that analysts consider the extent to which wireless and broadband services are available, used, and viewed by customers as reasonable substitutes for traditional wireline service. However, explicitly including wireline and broadband in competitive analyses results in its own set of problems, including difficulties in gathering information on wireless and broadband penetration in a state or within smaller market areas and in determining the extent to which wireless and broadband services are substitutable for traditional wireline service. Nevertheless, failure to include wireless and broadband services will bias competitive analyses towards concluding that incumbent wireline providers have more market power than they actually do. This could result in inappropriate regulatory and policy decisions.

Measurement or monitoring competitive conditions consists of logical steps: defining the market of interest in both product and geographic space, determining which producers and consumers are part of the market, measuring market shares and/or other indicators of the competitiveness of the market, and making a determination as to whether the market is or is not workably competitive.[123] Should the market not be workably competitive, various remedies and protections are available. Alternatively, if the market is moving towards workable competition, it might be allowed to evolve on its own – subject to periodic monitoring. If the market is already workably competitive, and if conditions are such that it is unlikely to be subject to

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[118] Primary use mobile wireless refers to those mobile wireless lines for which subscribers had given up their landline phones – a pure substitute. Source: e-mail to the author from Randy Klaus, Texas PUC staff, May 8, 2007.

[119] Ibid., 13-14 and Figures 3 and 4.

[120] Ibid., 1.

[121] Ibid., 12.

[122] Ibid., 23.

[123] See Section II, above, for discussion of workable competition.

market power, market forces should rule subject only to monitoring and policies aimed at ensuring consumer protection, public safety, and social objectives.

Section IV offers suggestions for including wireless and broadband services in competitive assessments of local telephone markets.

IV. Accounting for Wireless and Broadband in Analyses of Local Telephone Competition

Technological convergence, changes in policy embodied in the Telecommunications Act of 1996, and state and federal implementation of that Act have allowed multiple providers to offer telecommunications services that can be used to make and receive local telephone calls. When these services are offered over wireless and broadband platforms, they are not perfect substitutes for local wireline telephone service offered by ILECs; nevertheless, wireless and broadband services – especially wireless – have gained considerable customer acceptance. Thus, wireless and broadband services should be accounted for – somehow – in analyses of competitive conditions in local telephone markets. Failure to include wireless and broadband services in competitive analyses will bias conclusions towards finding that ILECs have more market power over basic local telephone service than they actually do and lead to more regulatory intervention than is necessary to achieve public interest outcomes. Conversely, assuming that the availability of wireless and broadband services automatically makes them adequate substitutes for local telephone service, thereby making local telephone markets fully competitive, will bias conclusions towards finding that ILECs have less market power than they actually do and lead to less intervention than is necessary. The question is not whether to account for wireless and broadband services, but how.

Previous Sections of this report have discussed competition, market power and its measurement, convergence, its effect on substitutability and its implications for competition in local telecommunications, and state attempts to consider wireless and broadband services in competitive analyses. The purpose of this background was to explain the importance of accounting for wireless and broadband technologies in analyses of competitive conditions in local telephone markets. This Section IV discusses the process of assessing the competitive conditions in local telecommunications markets and makes recommendations as to how states might undertake market power assessments. It also discusses several analytical approaches used by the New York State Department of Public Service, which has devoted considerable effort to the task.

A. Defining the market

The first task in assessing competition or determining whether a firm has market power is defining the market in which competition or market power is to be assessed. The market must be defined in both product space and geographic space.

1. The product market

The product market examined in analyses of competition and market power must be well defined. There is not one telecommunications product market, there are many. There are markets for local access and for long distance service; there are markets for basic service and for advanced services; and there are markets for residential and small business service and for large business service (sometimes termed the “enterprise” market).

Competition is important in all telecommunications markets; indeed, the 1996 Act was intended to promote competition in all of them. This report is focusing on the market for basic local residential and small business service and determining whether there are sufficient competitive alternatives to constrain market power in that product space.

There are several reasons for concentrating on basic service for residential and small businesses. First is a trend towards deregulation of service packages that bundle long distance and enhanced features with basic service.[124] Thus, basic local service is the product most closely regulated by state commissions. Second is state commission concern for universal service, which is defined in terms of making a set of basic services available in all areas of each state at an affordable price.[125] Third is the likelihood that larger business (enterprise) customers have more competitive alternatives and are more sophisticated buyers of telecommunications services than are typical residential and small business customers.[126]

Though the focus of competitive analyses should be on basic local services, state regulators cannot ignore wireless and broadband services because they are possible means of providing basic local service; and also they influence wireline markets.[127] Specifically, state regulators must consider the extent to which wireless and broadband technologies provide alternatives for consumers and limit the exercise of potential market power by ILECs in the market for basic local service.

If consumers view a non-wireline service as a substitute for basic local telephone service, any firm offering the non-wireline service to those consumers is necessarily in that market; its presence must be accounted for in measures of market concentration. As the FCC recently stated:

> [T]the market for local service [is defined] to include not only wireline local service, but also facilities-based VoIP service, and circuit-switched cable telephony service *to the extent that consumers view these as close substitutes for*

[124] Rosenberg and McGarvey (2005); Pérez-Chavolla (2007).

[125] Universal service goals include ensuring that affordable and adequate quality telephone service is available to all residents and to all areas. These universal service goals lead to multiple state and federal support programs including support for basic service in high-cost areas and subsidies for low-income households. For a discussion of universal service, see Rosenberg, Pérez-Chavolla, and Liu (2006a); for information on state universal service programs, see Liu and Rosenberg (2006).

[126] Alternatively, it is possible to do separate studies of the large business or enterprise market and the residential/small business market. This is essentially the approach taken in the FCC's Triennial Review Order, which asked states to consider impairment in each market separately.

[127] State regulators may also have consumer protection interests in the wireless and broadband sectors, but that is outside the direct scope of competition/market power analyses.

> *wireline local service*. In addition, the record evidence suggests that, for certain categories of customers, mobile wireless service is viewed as a close substitute to wireline local service.[128]

The FCC further stated that mobile wireless should be included in the market when it is used as a complete substitute for all the consumer's voice communications needs, but the FCC found the evidence inconclusive as to whether applications-based VoIP services (over-the-top VoIP) should be included in the market.[129]

Notwithstanding the fact that wireless service is generally more expensive than basic wireline service, there are many more wireless subscribers than wireline connections. In addition, wireless offers the advantage of mobility and personal rather than location-based service.[130] For many consumers, wireless service is substitutable for wireline service,[131] and wireless providers are offering increasingly attractive service packages as well as improving coverage, quality, and reliability. These factors allow an increasing number of consumers to view it as their primary means of telecommunications, in some cases becoming "wireless only." As was noted in Section III, recent data indicate that 12.8 percent of households were wireless only during the second half of 2006.[132]

There are, however, degrees of substitutability. To the extent that broadband VoIP service is interconnected with the PSTN, it substitutes directly for basic ILEC or CLEC wireline service.[133] Customers with an existing broadband connection to the Internet may find that VoIP provides a cost effective alternative to wireline telephone service. Customers without an existing broadband connection to the internet will find their total cost higher, though the combination of faster Internet access and the features available from VoIP can make it attractive, even at a higher cost.

In its 2005 Order approving the merger of SBC and AT&T, the FCC addressed the question of substitutability of applications-based VoIP service:

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[128] FCC (2007d), ¶ 90, emphasis added, footnotes omitted.

[129] Ibid., ¶ 94-95.

[130] The personal nature of wireless service is especially valuable for individuals and business people who are often on the move and want to be always connected. For businesses that make and receive calls mainly from a fixed location, mobility is not as valuable.

[131] In areas in which wireless coverage is spotty and signal quality is poor, the degree of substitutability may be significantly less.

[132] Blumberg and Luke (2007), 1.

[133] Interconnected VoIP service excludes pure computer to computer (peer to peer) VoIP services such as Free World Dialup and Skype.

> … [T]he requirement that a customer have broadband access to be able to use certain over-the-top VoIP services affects the substitutability of those services with wireline local service. Specifically, for customers that do not already have broadband access service, the subscription fee to obtain broadband access must be added to the subscription price for the over-the-top VoIP service when weighing it against the price of traditional wireline local service, and the extra fee could make substitution uneconomical. Even for consumers that have broadband service, however, their willingness to subscribe to over-the-top VoIP service in lieu of wireline local service will vary with the attributes of the service and the consumer's willingness to trade off service characteristics for lower prices.[134]

Thus, answering the question of whether applications-based VoIP should be included in measures of market concentration for basic local telephone service requires more information as to customer perceptions and observations on acceptance and use of applications-based VoIP as a substitute for basic local telephone service.

2. The geographic market

Once the product market has been selected, the next step is to determine the geographic market. The FCC has noted that "[t]he basic economic principle for defining the scope of the relevant geographic market is to include customers facing the choice of similar competitive alternatives in the same geographic market."[135] If the product market is determined to be basic residential and small business service, the geographic market is the area in which consumers buy basic local service. To make inferences as to competition and market power in a geographic market – and to base policy on those inferences, the geographic market should be defined so that there is little or no variation in the number and types of providers within a market. Variation is allowable between markets, but not within a market. Indeed, one way to determine the demarcation between geographic markets is a significant change in the identities, numbers, or types of providers serving the market.

The end result of a competitive analysis should be to align regulation to competitive conditions. The smaller the geographic area, the more specific the conclusions as to the competitiveness of the market. As an initial step, data on providers and services offered should be gathered at as granular a level as possible (probably at the exchange, wire center[136] or zip code level), recognizing that the more granular the data the more resources required by the analysis. The granular data can then be examined to determine whether aggregation of granular data into larger physical areas is appropriate. The geographic definition of the market should be the level of aggregation of granular data on providers and services offered that preserves homogeneity within a geographic market but allows for variation across geographic markets.

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[134] FCC (2005b), ¶ 88, note omitted.

[135] FCC (2006), ¶37.

[136] A "wire center" is the point of termination of customers' local loops. A wire center is the "central office" housing the switch that serves the customer.

The choice of an appropriate geographic market is one of the first empirical questions that must be addressed by the competition analyst. Various definitions of the geographic market are possible. The largest geographic market is the entire state. However, a whole state is generally too large to be used to define the geographic market,[137] since the identities, numbers, and types of providers can vary considerably across a state. Sub-state levels for defining the market include ILEC service territories, ILEC local calling areas,[138] ILEC study areas used to determine eligibility for high-cost universal service support,[139] LATAs, Metropolitan Statistical Areas (MSAs),[140] counties, wire centers, exchanges, and ZIP Codes. Larger ILECs' service territories are also likely to exhibit too much variation in competitors to be considered as the geographic market.

B. Assessing concentration measures of market power within the defined market

Once the product and geographic space has been determined, the analysis proceeds by determining who is serving the market, whether a dominant firm exists, whether any firm has market power and is exercising it, and what constraints there might be on a firm's market power. The central question is: Do consumers have alternative sources of service available that they could and would shift to easily if a dominant firm attempted to exercise market power? To answer this question the analyst must determine which suppliers are serving the market (or could easily do so), how substitutable their services are for the dominant firm's, and how the presence of alternative suppliers is affecting the market.

In considering local telephone markets, the easiest data to obtain is the number of ILEC lines, the number of wireline CLECs serving the market, and the number of lines each CLEC serves. However, this information covers only non-broadband wireline telephone service. Wireless and broadband service should be included to the extent that they substitute for basic wireline service.

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[137] In small states with uniform statewide competitive conditions, it is appropriate to consider the state as the geographic market. However, even in small states, it would still be useful initially to consider smaller geographic divisions to test the assertion that competitive conditions are uniform across the state.

[138] The local calling area is the area within which a consumer can place a call without incurring a toll or long distance charge. In debates over intercarrier compensation, the local calling area often identifies the demarcation between traffic for which terminating carriers receive reciprocal compensation and traffic for which they receive access charges.

[139] An ILEC's service territory may contain a single study area or be disaggregated into multiple study areas.

[140] A metropolitan statistical area is a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. See U.S. Census Bureau, "About Metropolitan and Micropolitan Statistical Areas," http://www.census.gov/population/www/estimates/aboutmetro.html, accessed May 17, 2007.

By some measures, local telephone markets are highly concentrated and would seem susceptible to the exercise of market power. Though CLEC shares vary across and within states, areas in which the ILEC are not in a dominant position are rare. In June 2006, after over ten years of local competition, ILECs still served over 80 percent of national wireline connections, and the CLEC share was lower in June 2006 than it was in June 2004.[141] However, this calculation of ILEC national market share excludes wireless and broadband service and will bias market power determinations to the extent that these non-wireline services are substitutes for basic local service. To obtain a clear picture of competitive conditions and market power in local telephone markets, concentration measures such as the HHI must include wireless and broadband services, to the extent they are viewed by consumers as substitutes for wireline services.

Though they must be included in calculation of measures of concentration, simply adding the number of wireless and broadband connections to the number of wireline connections when calculating market shares and HHIs would be misleading. Although the availability of these platforms serves to limit market power in basic wireline service, wireless and broadband services do not offer prefect substitutes for wireline service. Furthermore, growth in wireless and broadband do not, by themselves, provide conclusive evidence of competition with or substitutability for wireline service, since at present the great majority of households with wireless telephones also have some form of wireline connection, and most households with a broadband connection retain wireline service. For these households, at least at the access level, substitution is not occurring.[142]

When including wireless and broadband in market share calculations, it would be prudent to include them with weights less than one, with the particular weight based on the perceived level of substitutability. Substitutability weights could be determined from econometric results (statistical estimates of demand elasticities), if available, or from responses to consumer surveys.[143] Also, wireless and broadband telephone service may not be attractive substitutes for

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[141] FCC (2007a), Table 1. Some of the shrinkage in CLEC share during this period is because the FCC eliminated the ILECs' obligation to provide CLECs access to the ILECs' unbundled switching at rates determined according to the Total Element Long Run Incremental Cost (TELRIC) UNE pricing standard that the FCC adopted in the its *Local Competition Order* [FCC (1996), ¶ 774-703]. As a result, the CLECs could no longer obtain switching from ILECs as an unbundled network element at TELRIC rates. This change made it more difficult for CLECs to add customers, because it increased CLECs' cost of serving their customers.

[142] However, even though they retain a wireline connection, consumers may be substituting wireless and/or broadband usage for wireline usage.

[143] If, for example, survey results indicate that 16 percent of wireless customers have dropped wireline service in favor of wireless, then 16 percent of total wireless subscribers in a geographic market would be included in calculating concentration measures such as the HHI. A similar calculation could be applied to the number of broadband subscribers in a geographic market.

Lifeline customers[144] and others who do not already have wireless service or a broadband connection and want only a no-frills, basic service.[145]

A general approach for including wireless providers in market share calculations would be to make a substitution adjustment and use estimates of the proportion of wireless-only households to estimate the number of wireless-only households in a geographic market and include only that number in market share calculations.[146] Using an estimate of the number of wireless-only households in a market adjusts for the fact that, at present, most households have both wireline and wireless service.

If wireless shares are included in HHI or other concentration measures, one question that must be addressed is whether to treat wireless affiliates of the ILEC in a geographic market as independent companies. This question arises because some ILECs have large wireless affiliates. Indeed, the two largest wireless providers nationally are affiliated with the two largest ILECs.[147] Three approaches might be used:

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[144] Lifeline customers receive basic local telephone service at a rate subsidized by the federal Lifeline Program (one of the federal universal service programs). Eligibility for Lifeline subsidies requires that customers meet state-determined low-income tests, and most states add their own subsidy. See Rosenberg, Pérez-Chavolla, and Liu (2006a) and Liu and Rosenberg (2006).

[145] On the other hand, the savings that broadband telephone service offers may provide the inducement for some customers who would not otherwise purchase a broadband connection to do so. The extent to which services such as prepaid wireless service are substitutes for basic local telephone service provided under the Lifeline program are not known at this time, but Blumberg and Luke (2007) did find that poorer households were more likely than higher income households to be "wireless only."

[146] If, for example, survey results indicate that 16 percent of wireless customers have dropped wireline service in favor of wireless, then 16 percent of total wireless subscribers in a geographic market would be included in calculating concentration measures such as the HHI. A similar adjustment could be applied to the number of broadband subscribers in a geographic market. National estimates of the proportion of wireless-only and broadband-only households could be used, but more specific data gathered at the state or geographic market level would be preferable.

[147] At year-end 2005, Verizon Wireless and Cingular Wireless (now AT&T) accounted for slightly more than half the 207.9 million wireless connections reported by the FCC. Verizon Wireless had 54.1 million subscribers (26 percent), and Cingular Wireless had 51.3 million subscribers (24.7 percent). The next largest wireless providers were: Sprint Nextel with 44.8 million subscribers (21.6 percent), Alltel with 10.7 million subscribers (5.1 percent), and US Cellular with 5.0 million subscribers (2.4 percent). No other wireless provider had as much as 1 percent of the total market. See FCC (2006), Tables 1 and 4.

1. Treat the ILEC and its wireless affiliate as independent companies and include the affiliate's substitution-adjusted subscribers when calculating the market HHI. This approach assumes that the ILEC and its wireless affiliate compete rather than cooperate.

2. Exclude the affiliated wireless provider's substitution-adjusted subscribers when calculating the market HHI. Include only the substitution-adjusted subscribers of unaffiliated wireless providers. This approach focuses only on the strength of providers unaffiliated with the ILEC.

3. Add the affiliated wireless provider's substitution-adjusted subscribers to the ILEC's wireline subscribers when calculating the market HHI. This approach assumes that affiliates cooperate rather than compete.[148]

In markets with an ILEC with a large wireless affiliate, the first approach would maximize the estimated effect of wireless competition. The second and third approaches would indicate less of an effect of wireless competition, but actual data is required to determine whether, on balance, the second or third approach would indicate less competitive markets. However, in markets served by an ILEC with a large wireless affiliate, the third approach would indicate a less competitive market than would the second approach.[149]

C. New York's analyses of the effect of wireless and broadband on market power in local telephone markets

The New York State Department of Public Service and the New York Public Service Commission have undertaken several analyses that included wireless and broadband technologies in competitive assessments of local telephone markets. In the various analyses, the method used to include wireless and broadband technologies has been refined.

1. The 2005 New York State Department of Public Service Staff White Paper

The New York State Department of Public Service (NYDPS) 2005 staff white paper, *Telecommunications in New York: Competition and Consumer Protection,*[150] was undertaken with the intent of considering the effect of intermodal competition among wireline, wireless, and broadband products, and to assess how state regulation might adapt to that competition.

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[148] We note marketing programs that offer the "quadruple play" (wireline, video, data, and wireless) in a single package.

[149] The usefulness of concentration measures such as the HHI depends on whether they provide useful indicators of whether a market is likely to be subject to market power. Thus, it is difficult to choose between adjusted HHI measures on *a priori* grounds.

[150] New York State Department of Public Service (2005).

In describing the changes in telecommunications markets and the options available to consumers today, the 2005 white paper states that most New Yorkers have the choice of a number of providers of services, including intermodal (e.g., wireless and cable) providers. Moreover, the 2005 white paper estimates that 90 percent of New Yorkers have the choice of at least two intermodal alternatives to the ILECs' wireline networks and notes that the ILECs are losing customers, lines, usage, and revenues.[151]

The 2005 white paper also distinguished between (a) competitive alternatives available to customers wanting service having many optional functions and features, and (b) alternatives available to customers wanting basic service only. The 2005 white paper notes that some options are unavailable in some locations or may be inadequate substitutes for some customers. In addition, though customers who subscribe to feature-rich packages may find several acceptable substitutes in the market, meaningful choices may not be widely available for customers seeking only basic telecommunications needs.[152]

The 2005 white paper notes that, although intermodal services have different characteristics than wireline service, they nevertheless provide competitive alternatives:

> Telephone services provided via the alternative platforms do not need to be considered perfectly substitutable services from the customer's point of view for them to affect, and to constrain, the pricing decisions of an ILEC. To be price constrained, the ILEC need only conclude that enough of the customers would switch services. Although 92% of New York consumers have at least two alternative platforms only a fraction (e.g., 7%) of those would need to actually exercise those options to affect the incumbent's financial position.[153]

In discussing measures of competition, the 2005 white paper makes reference to a competitive index (the TRO Index) developed by the NYDPS for use in the competitive impairment analysis called for in the FCC's *Triennial Review Order*.[154] However, the 2005 white paper went on to

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[151] Ibid., 4.

[152] Ibid. To provide protection for basic service customers, the 2005 white paper recommended that Verizon and Frontier "be required to continue to offer a no frills basic service subject to a regulated statewide price cap ...."

[153] Ibid., 33-34. This conclusion appears to rely on an approach known as "critical loss analysis," which estimates the sales loss that would prove unprofitable for the incumbent. Critical loss analysis makes use of demand elasticity and price - variable cost margins to determine whether, as in the case of the DOJ/FTC merger analysis, a firm would find it unprofitable to exercise market power and raise prices by a specific amount. For further explanation of critical loss analysis, see O'Brien and Wickelgren (2003).

[154] New York State Department of Public Service (2004). The FCC's *Triennial Review Order* [FCC (2003)] attempted to delegate to the states the responsibility for determining whether CLECs would be impaired from competing if the unbundled switching component and interoffice transport were not available from the ILEC at mandated TELRIC rates. Impairment

describe a refined and modified version of the TRO index, which it called the competitive indicator. Each of these measures bases its competitive determination on the availability of alternative technology platforms including wireless and broadband. They are described in turn.

a. The NYDPS TRO Index

In the 2005 white paper, the NYDPS made an explicit attempt to account for the effect of intermodal competition in making competitive determinations concerning basic telephone service markets. The TRO index is a weighted calculation designed to represent the availability of alternatives in the area served by a wire center. The index measures the competitive alternatives to the ILEC's wireline service; the total index value reflects both the availability and the assumed relative substitutability of various intermodal alternatives. If they are available to customers in a wire center, intermodal alternatives were assigned the following weights:

1.00 for UNE-L providers of residential service (CLECs);[155]

0.50 for UNE-L providers of 18 or fewer lines;[156]

0.75 for the availability of Internet access via cable modem or DSL (applications-based VoIP availability);[157]

1.00 for the availability of PacketCable phone service offered by a cable system (facilities-based VoIP); and

0.50 for providers of wireless service, if there are more than two wireless offerings available.

The value of the TRO index for the geographic area served by a wire-center is calculated by summing the components for each wire center. In making the determination of competitiveness, an index value of 2.75 is used as a trigger value or critical value. A TRO index value less than 2.75 indicates that there are not sufficient competitive alternatives to constrain

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was to be determined on a granular, wire-center basis. The FCC's delegation was overturned, leading the FCC to adopt national presumptions with respect to impairment in the *Triennial Review Remand Order* [FCC (2005)].

[155] UNE-L or UNE-Loop refers to a mode of competitive entry in which a CLEC leases an unbundled loop or access line from an ILEC and uses its own facilities to provide other functions. A CLEC can provide telephone service to a customer by leasing the customer's unbundled local loop from the ILEC and connecting the loop to a switch provided by the CLEC or by another entity.

[156] I.e., if CLECs serve only a few lines in a wire center, their weight in the index is reduced.

[157] If customers have access to cable modem of DSL broadband connections, they can use an applications-based VoIP service such as Vonage to make and receive telephone calls.

market power in the wire center. Conversely, if the calculated value of the TRO index is equal to or greater than 2.75, the NYDPS concludes that sufficient competition exists to constrain the exercise of market power in the wire center. The NYDPS noted that the maximum value of the index is 3.25, and recognized that the presence of each alternative is not necessary to conclude that the market in the wire center is competitive.[158]

In its discussion of the applicability of the TRO index, the 2005 white paper noted that the use of wire-center data might not be required for competitive assessment, since ILECs offer packages and set prices on a service area or regional basis. Also, it would be administratively impractical to apply regulatory policy at the wire-center level.[159] Thus, the NYDPS "conducted a competitive indicator analysis by looking at the availability of alternative platforms for service offerings that customers are using and may use as substitutes for traditional wireline services."[160]

b. The NYDPS 2005 competitive indicator

In the 2005 white paper, the NYDPS indicated that, though it believed that wire centers, as used in the TRO index, are the most appropriate unit for measuring competition, additional data is required to most accurately measure the state of competition. Thus, the NYDPS developed a competitive indicator to monitor competition in all parts of the state, including the service territories of the independents.[161]

The competitive indicator proposed by the NYDPS in the 2005 white paper is a refined version of the TRO index. The 2005 competitive indicator considers only the availability of broadband and wireless platforms not affiliated with the ILEC. It also considered the extent to which consumers are subscribing to alternative service offerings. The analysis "support[s] the notion that consumers are actually utilizing these alternative services to satisfy their telecommunication needs and are embracing them as substitutes for traditional wireline service."[162] Moreover, the 2005 white paper notes that that the availability of a platform may allow customers to choose from multiple providers. For example, customers with cable modem connections have the option of buying VoIP service from the CSO or from an application-based provider.[163]

The 2005 white paper's competitive indicator analysis identified three platforms; traditional wireline, wireless, and broadband. If all three platforms are available to customers in

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[158] New York State Department of Public Service (2004), Appendix A, iii.

[159] New York Department of Public Service (2005), 30-31.

[160] Ibid., 31.

[161] Ibid.

[162] Ibid., 32.

[163] Ibid., 33.

a particular area, the NYDPS concluded that competition is sufficiently robust to constrain the ILEC's ability to raise prices excessively.[164] It is interesting to note that in calculating the value of the competitive indicator for a wire center, the NYDPS staff considered the availability of alternative platforms (wireless and broadband) but did not assess the availability of UNE-L CLEC providers. Though unstated, the omission of wireline CLEC competition from the analysis indicates that, at that time, the NYDPS staff believed that competitive pressure would come from alternative platforms, not from wireline CLECs.

In assessing whether a competitive broadband platform was available, NYDPS staff attempted to identify the proportion of the population in each wire center which had either cable or DSL broadband available to them. NYDPS staff concluded that broadband was a reasonably competitive platform in that wire center if two thirds or more of the population weighted zip codes in a wire center contained either cable or DSL broadband options.[165]

In assessing whether a competitive wireless platform was available, NYDPS staff concluded that wireless was a reasonable competitive platform if two or more unaffiliated wireless providers located antennas in the wire center service territory. NYDPS staff identified wireless providers in each wire center and assigned a wireless availability score of 1 to the wire center if it appeared that two or more unaffiliated wireless providers located antennas in the wire center.[166]

The value of the competitive indicator for a wire center would be zero if neither broadband nor wireless were judged to be competitively available in the wire center, one if either (but not both) wireless or broadband were judged competitive in the wire center, and two if both wireless and broadband were judged to be competitive in the wire center. Ninety percent of New York customers were found to be served by wire centers with both competitive options.[167]

The question of whether an ILEC would be harmed should it raise prices by five percent, hinged on the assumed value of the own price elasticity of demand for the ILEC's service. The NYDPS staff assumed that customers with two options (competitive indicator value of two) in addition to the ILEC have a price elasticity of -1.5, and that customers without two options in addition to the ILEC (e.g., captive customers) have a price elasticity of -0.5. They then estimated the net revenue impact of a five percent price increase by the ILEC. If the ILEC would lose enough customers to make the price increase unprofitable, it was considered price

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[164] Ibid., Appendix E.

[165] FCC broadband deployment data is available by zip codes rather than by wire centers, so zip codes were aggregated into wire centers. Moreover the calculation considers the population of each zip code and provides a weighted number if broadband is not available in all Zip Codes assigned to a wire center. Ibid.

[166] Ibid. However, all wire centers in major cities were considered to have wireless platform alternatives.

[167] Ibid.

constrained in the wire center. On an individual ILEC basis, revenue simulations were conducted based on the assumed elasticities and the proportion of the ILEC's customers that are served by competitive and uncompetitive wire centers.

2. The 2006 New York Public Service Commission Order

In April 2006, the New York Public Service Commission (NYPSC) considered the 2005 white paper and other evidence and issued an Order[168] that lessened regulation on Verizon and Frontier, especially with respect to non-basic services. In discussing the evidence in the 2005 white paper, the NYPSC noted that static competitive measurements such as the Herfindahl-Hirschman Index (HHI) fail to recognize the dynamic nature of the market – e.g., the threat of imminent competition already serves as a significant constraint on incumbent behavior.[169]

With respect to the substitutability/competitiveness of applications-based VoIP services, the NYPSC noted:

> [Applications-based VoIP services] have different service characteristics, like self installation, and may not be viewed widely as close substitutes. But given that in excess of 35% of New Yorkers already subscribe to some kind of high speed broadband service, these customers could subscribe to an application based VoIP service being offered by a number of providers such as Vonage without an additional subscription to broadband.[170]

With respect to the substitutability/competitiveness of wireless services for wireline service, the NYPSC took notice of an FCC finding that approximately six percent of households have chosen to rely on wireless services for all of their communications needs[171] and noted:

> Although … not all customers will view wireless service as a complete substitute for traditional wireline service, we agree with the [w]hite [p]aper that a growing number of customers are willing and able to consider wireless as a close substitute for wireline service.[172]

In summing up the competitive situation in New York, the NYPSC stated:

> The degree of competition is clearly reflected in the continuing incumbent line losses, the current availability and rapid expansion of wireless and VoIP services,

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[168] New York Public Service Commission (2006).

[169] Ibid., 25.

[170] Ibid., 34.

[171] Ibid., 35, note 80, citing FCC (2005c), ¶ 91.

[172] Ibid., 35.

> and the competition-driven revenue losses, as well as declines in earnings and, in some instances, losses.[173]

Moreover, the NYPSC was not concerned that the telephone market might become a duopoly, since:

> There are three, not two, major pathways into the customer's premises: traditional wire, wireless, and broadband via cable. Furthermore, within each pathway there are multiple providers of telephone services, especially so for providers of telephone service over broadband.[174]

The NYPSC continued:

> [W]e agree with the [w]hite [p]aper's conclusion that bundled telecommunication services, VoIP, and wireless are all in competition with unbundled wireline services, as the incumbent's continuing loss of lines and access minutes strongly suggests.[175]

The NYPSC noted that it will revisit the question of competitiveness in telecommunications markets and that among the items of interest will be: (1) service quality results in competitive areas as compared in noncompetitive areas, (2) price changes that have occurred, (3) entry and exit of competitors, and (4) loss of ILEC lines and minutes of use.[176]

Finally, in its overall assessment of competition, the NYPSC found that

> the telecommunications market in New York State is, in aggregate, adequately competitive. Perfect competition, which is the ideal, is not needed; the market need only be adequately competitive. Given the inefficiencies inherent in economic regulation, a market need not be perfect, or even near-perfect, to produce better outcomes for consumers than traditional regulation, given the well documented inefficiencies of the latter, and its shortcomings in an increasingly competitive market. Therefore, despite the lack of the ideal of a perfectly competitive telecommunications market in New York, we find that the forces of competition are sufficiently strong, both now and for the foreseeable future, to easily be considered an adequately competitive market.[177]

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[173] Ibid., 37.

[174] Ibid., 39.

[175] Ibid., 40.

[176] Ibid.

[177] Ibid., 42.

3. The New York Department of Public Service 2007 White Paper

In April, the NYDPS released its 2007 white paper, *Framework for Regulatory Relief*.[178] The 2007 white paper proposes a framework to guide the NYPSC's determinations granting regulatory relief to ILECs in light of the individual competitive challenges faced by each company.[179]

The 2007 white paper extends and updates the 2005 white paper. Instead of considering only the availability of alternative platforms as in the 2005 white paper, the 2007 white paper uses a four-dimension indicator of competitive conditions. The dimensions are: (1) competitive presence (availability of alternative providers), (2) financial status of the ILEC (revenue growth, return on equity), (3) network investment (service quality, broadband deployment), and (4) operating efficiency.[180]

As in the 2005 white paper, the 2007 white paper assumes that the more alternatives available to customers in an area, the more elastic will be demand for the ILEC's service. However, the 2007 white paper calculates an average elasticity for each ILEC based the competitive and operational factors noted above.[181] After calculating an average demand elasticity for each ILEC, the 2007 white paper considers whether a five percent price increase in that ILEC's basic service rate would be profitable or unprofitable. The effect of a five percent price increase on the individual ILEC's revenues was calculated, and firms that would suffer a revenue loss greater than 2.5 percent were considered to be price-constrained by competition.[182]

As in the 2005 white paper, the 2007 white paper divides customers to two classes: those with competitive options and those without options (captive customers). The 2007 white paper notes that whether an ILEC would find it profitable to increase prices depends on the response of customers and that:

> The main difference in modeling the two groups of customers is the price elasticity of demand chosen for each group. Customers with options are much more elastic because they have the option of switching to a competitor. The group of customers without options ("captive customers") will most likely stay with the ILEC, but may reduce their level of usage in response to the price increase. The company will lose revenues associated with the group of customers with options, but raise revenue from the group of captive customers. The overall revenue effect depends on whether the loss in revenues from the

[178] New York State Department of Public Service (2007b).

[179] Ibid., 6.

[180] Ibid., Table 1.

[181] Ibid., Table 2.

[182] Ibid., 16. See also, Weisman (2006), who is cited Ibid., note 24.

group with competitive options outweighs the gain in revenues from the group without options.[183]

For customers without options, an assumed elasticity of -0.5 was used.[184] For customers with competitive options, the elasticity estimate used in the 2007 white paper is based on evaluation of six ILEC-specific factors that affect consumers' price sensitivity. These factors are measured for each ILEC and are combined to estimate an ILEC-specific elasticity. The six elements used to determine the elasticity factor are: (1) growth rate of access lines, (2) growth rate of minutes of usage (MOU), (3) percentage of territory with competitive wireless coverage, (4) percentage of customers with cable phone available, (5) customer density (telephone lines per square mile), and (6) ratio of ILEC residential rate to competitive cable phone rate.[185] The higher the value of each of these elements, the more likely customers will switch to a competitor. The resulting range of estimated elasticities for customers with options ranges from -1.1 to -2.0.[186] The results of the analysis indicated that 29 of 40 ILECs were price constrained.[187]

In addition to elasticity estimates, the 2007 white paper evaluated other indicators of competitive pressure such as changes in revenue subject to jurisdictional separations[188] and return on equity for each ILEC.[189]

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[183] Ibid., 13.

[184] Ibid., 14. Note that this value was also used for captive customers in the 2005 white paper.

[185] Ibid. 14.

[186] For customers with competitive options, three levels of elasticity were assumed: low, -1.1; medium, -1.5; and high, -2.0. Each element was assigned a high, medium, or low elasticity, and the average was calculated across the six elements. Ibid., 15.

The elasticity estimates, though not estimated in the white paper, were selected after reviewing a number of published econometric studies that had estimated demand elasticities for utility services. See Ibid., Appendix I. Note that the high elasticity value is greater (absolutely) than the -1.5 value used for customers with options in the 2005 white paper.

[187] Ibid., 17, Table 4.

[188] Jurisdictional separations is used to divide regulated revenues and expenses between the interstate and intrastate jurisdictions. The FCC's rules for separating revenues and expenses between jurisdictions are contained in 47 C.F.R. 36. Revenues subject to jurisdictional separations are all revenues that must be divided between jurisdictions. Revenues from unregulated operations are excluded from the separations process.

[189] Ibid., 21-23.

D. Other measures or indicators

1. Availability of alternative platforms

The New York DPS's TRO Index (discussed above) treats wireless and broadband services as being partially substitutable for wireline service. This index, which is based on availability of alternative platforms rather than their penetration or market shares, is easier to construct and calculate than measures of concentration. The other measures suggested by the New York DPS in their 2005 and 2007 white papers offer alternative means of indicating whether consumers have enough substitutes available so that the ILEC lacks market power.

Consider also an NRRI proposal regarding competitive classification of services under alternative regulation. The NRRI proposed that for an ILEC to be allowed the highest degree of pricing flexibility for a service,

> [t]here must be at least three viable competitors, unaffiliated with [the ILEC], each of which (a) is capable of providing and adequate alternative service and (b) is actively soliciting business *throughout* the relevant geographic area. The same three competitors need not serve the area uniformly, but the entire area must have at least three active competitors.[190]

2. The Lerner Indexes and rates of return

Other conventional measures or indicators of market power may require some adjustment before application in this context. Markets with high fixed costs or economies of scale will lead to relatively high observed Lerner Indices if firms are to be viable over time.[191] Therefore, a high Lerner Index should not be used by itself as an indicator of market power. Instead, an appropriate benchmark Lerner Index value that accounts for fixed costs in production should be used. If there are economies of scale, some of the observed markup is necessary to keep firms viable, and some of the observed markup reflects market power.[192] Conversely, the Lerner Index assumes that the firm is maximizing its profits so that the observed price is the profit maximizing price. This assumption may not be true in the case of basic local telephone service, because ILECs are generally subject to some form of price regulation. In addition, basic local telephone rates are subject to an affordability standard, and thus are subsidized in high-cost areas in the

[190] Davis, Lawton, and Rosenberg (1994), Table 8-5, emphasis in original. The NRRI also recommended that for full competitive classification for a service, the ILEC could have a market share of no greater than 45 percent and that there be two identifiable competitors with shares of at least 10 percent – or one competitor with a share of at least 25 percent.

[191] If there are significant fixed costs in production, a firm that prices at marginal cost cannot survive, since its revenues will not cover total costs. Thus, some deviation of price from marginal cost is required for the firm to be viable.

[192] Gual (2003), 6-9.

name of universal service. These factors lead to the conclusion that, unless adjusted, the Lerner Index is not useful for indicating market power in local telephone markets.

For similar reasons, measured rates of return may not be strong evidence of market power. Accounting profit margins and rates of return on investment for individual services are sensitive to the cost allocation rules applied. In the case of multi-product firms with high fixed costs and economies of scale and scope, it is extremely difficult, if not impossible, to determine to any degree of certainty the cost – and thus the profit margin and rate of return – of a particular product. Thus, measured rates of return, especially for individual services should be used with caution, if at all. However, if used in conjunction with other evidence, trends in rates of return over time for individual ILECs are useful for detecting whether competitive pressure is increasing.

3. Behavior of firms and consumers

Observations of the behavior of firms and consumers can also be used to obtain qualitative information about the degree rivalry or competitiveness of the market. Are firms entering and staying in the market? Do firms engage in rivalry through advertising and by offering a variety of service packages and pricing plans? Are consumers switching between providers in significant numbers? Affirmative answers are some evidence of workable competition.[193] Conversely, negative answers provide evidence that competition is not workable.

Competition is supposed to pressure firms to be efficient, reduce costs, and hold down prices. Thus, observations of the behavior of ILECs themselves can be used to evaluate market power or the lack thereof. If ILECs forego price increases allowed under price cap or similar plans, that fact may indicate that they lack market power. For example, it was recently reported that Verizon asked for a rate increase in New York that was 38 percent less than it could have had under its price-cap plan. This reduced request was interpreted as "an indication … that they felt constrained in some way by market competition …".[194] Similarly, in 2006 the Missoula Plan for reforming intercarrier compensation proposed that, in return for lowering interstate and intrastate access charges, ILECs be allowed raise their federal subscriber line charges (SLCs) by as much as $3.50 per access line per month. Some ILECs objected to this because they felt that they would not be able to impose such an increase in light of competitive pressures. Their

[193] For example, the FCC concluded that wireless markets were competitive even though the median HHI in wireless markets was 2785. The FCC's conclusion was based, in part, on observations of active price rivalry (differentiated pricing plans and service packages) and non-price rivalry (coverage, call quality, technology deployment). FCC (2006), ¶¶ 45, 90, 101.

[194] Verizon could have requested a $2 per month increase; instead, it requested $1.24 per month. Robert Mayer, Director of the New York PSC's Office of Telecommunications, quoted in "Intermodal Competition Rising In New York, Report Finds," *Telecommunications Reports*, May 1, 2007.

concern was that, because the SLC increase would be added to local bills, consumers might migrate to wireless providers and CLECs, neither of which impose the SLC.[195]

If, on the other hand, ILECs continue to raise prices as much as allowed, or if rate of return regulated companies come in for increases, that may be a sign that competition is not effective in constraining prices.

E. Gathering information

1. Data from firms and other sources

As described above, commissions undertaking a competitive analysis need to determine who is providing what services and in what amounts in the markets they are assessing. This effort requires data-gathering, sometimes from reluctant non-jurisdictional providers. However, without reasonably full information, commissions risk making incorrect determinations about market power. To the extent that it can be obtained, information on the behavior of firms – market entry and exit, services offered, prices – is useful for gauging the extent of rivalry in the market. Also useful are data on whether the ILEC is losing customers and revenues to competitors and data on the number of ILEC customers choosing basic service packages versus bundles including enhanced features and services.

As a number of commissions noted, some data is be difficult to obtain, especially from wireless and broadband providers that are under no obligation to respond to a data request or provide data. Moreover, some information is proprietary, especially when requested on a granular level. Among the options commissions might consider are using numbering data bases (which show the allocation of telephone numbers to various providers) to estimate market shares,[196] requiring all eligible telecommunications carriers (ETCs) that receive federal universal service support to report customer information, conducting consumer surveys, and seeking additional information gathering powers from legislatures.

2. Consumer survey data

Consumer surveys can provide useful factual, perceptual, and behavioral information. A stratified[197] random sample of households could be surveyed to determine the types of telephone

[195] Rosenberg, Pérez-Chavolla, and Liu (2006b).

[196] Though not perfect, numbering utilization data bases linking providers and assigned numbers can provide useful information. Because some VoIP providers allow non-jurisdictional customers to obtain numbers in an area code, these data will not be perfect. However, assigned or working numbers are one indicator of market presence.

[197] A stratified sample is designed to reflect the makeup of the population of interest. Stratification factors include income, age, gender, ethnicity, and location. An alternate approach would be to conduct a random sample that was sufficiently large to ensure an adequate number of responses in all the various strata of interest.

services they use and who provides them would provide factual information as to which providers are serving which customers where.[198] Information could also be gathered regarding customer perceptions of substitutability and competitiveness of various types of service, customers' history of switching providers, their willingness to switch again, and what might lead them to switch. Moreover, if surveys are repeated over time with some of the same households and business participating in multiple surveys, changes in consumer perceptions as to substitutability and competitiveness can be tracked. However, surveys of consumer intention or willingness to switch require caution, since they are based on hypothetical questions rather than real behavior.[199] Nevertheless, consumer awareness and perception of competitive alternatives would be useful information. Data on actual customer choices and movement between local service providers could be used to calibrate hypothetical responses.

An example of state use of a consumer survey is the NYDPS' April 2007 *New York State Residential Telecommunications Consumer Survey*,[200] which assessed the availability and adoption of intermodal telecommunications services. More than 1,500 randomly selected residential consumers were asked questions regarding (a) the services they subscribe to, (b) their awareness of alternative services, (c) their satisfaction with existing services, and (d) their motivation for switching suppliers. Among the results are:

> … [A]pproximately 25% of the respondents obtain their [local] telephone service from a provider other than an incumbent local exchange carrier (ILEC). A large majority of respondents are satisfied with their residential phone, Internet phone, cellular phone, high-speed Internet, cable, and satellite television services. Over 20% of the respondents indicated that they would consider disconnecting their home phone service to rely exclusively on cellular phones and over 40% of the respondents indicated that they would consider switching their home phone service to a service provided by a cable company.[201]

Moreover, the NYDPS survey found that the availability of alternative platforms is widespread – an estimated 95 percent of respondents have the choice of two alternatives to traditional wire-line phone service.[202] However, the NYDPS survey notes that "[a]lthough a significant amount of intermodal competition has recently taken place, there remains a substantial body of satisfied

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[198] Similar information may be available from providers.

[199] In the years following AT&T's divestiture of the Bell Operating Companies, the interexchange carriers (the largest being AT&T, MCI, and Sprint) engaged in marketing campaigns to encourage customers to switch carriers. Various inducements were offered for switching, and some customers switched back and forth several times to obtain inducements or for better deals.

[200] New York State Department of Public Service (2007a).

[201] Ibid., 3.

[202] Ibid., 4.

customers who might be much less likely to shop around for telephone service absent a significant change in price."[203]

Respondents to the NYDPS survey indicated that 37 percent were familiar with Internet phone service; 21 percent had switched telephone service in the past year; 38 percent had switched telephone service in the past five years; and 63 percent of those who had switched identified price as a primary reason for switching providers. However, less than 20 percent planned to switch any service in the next few years. Again, price would be a prime motivation for switching. Respondents would be more than three times as likely to consider switching telephone service as a result of a change in price (73 percent) as would consider switching for improved reliability (23 percent), the next highest reason identified as a motivator for switching.[204]

With respect to intermodal competition, the NYDPS survey found that over 20 percent of respondents would consider disconnecting their home phone service to rely exclusively on cellular phones. However, they identified reliability of the cell phone, static, bad service quality and reception, and bad sound clarity as reasons for not substituting cell service for wire-line service. At the same time, over 40 percent would consider switching to a service provided by a cable company over the next couple of years.[205]

An interesting result of the NYDPS survey was that over 40 percent of subscribers to telephone service offered by cable system operators do not realize that they are using an Internet telephony or VoIP service.[206] This result may reflect the idea that consumers are neutral with respect to technology; they just want good service at an acceptable price. As might be expected for adoption of newer technologies, younger and higher income households were more likely to subscribe to internet phone service.[207] Demographic patterns (age and income) in the use of internet phone service thus followed the demographic pattern of high-speed internet subscription rates.[208]

3. Econometric analysis

Econometric analysis (statistical estimates of demand elasticities) is useful because it is evidence derived from observations of actual consumer and producer behavior. However, econometric evidence is often difficult to obtain. Econometric analysis of competitiveness and

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[203] Ibid., 5.

[204] Ibid., 6.

[205] Ibid.

[206] Ibid., 12.

[207] Ibid., 13-14.

[208] Ibid., 19.

substitutability requires estimates of various own price and cross price elasticities.[209] Good elasticity estimates require a considerable amount of data on the variables that affect demand: prices, quantities, and income, for example. Moreover, there should be enough data points collected over time and/or across a number of separate markets to allow for reasonably precise estimates. It will be difficult to construct an adequate data set given the relatively short period over which wireless and broadband technologies have been seen as substitutes for basic wireline service.[210] Discrete choice models of consumer behavior can be used to model consumer choice between types of technology, but careful and detailed analysis and good data is required.[211] The foregoing does not argue against econometric analysis of actual market data. Instead, it acknowledges that gathering and interpreting the data is a nontrivial task that requires time and resources. The difficulties involved are reflected in the lack of carefully conducted current studies.[212]

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[209] A high absolute estimate of price elasticity is evidence of a lack of market power; a low estimate is evidence of market power. If an ILEC faces an elasticity between zero and -1.0, it is certainly not price constrained – its revenues and profits will increase if it raises its price. If an ILEC faces a price elasticity greater (absolutely) than -1.0, it may be price constrained depending on the ratio of marginal to fixed costs in its cost function. The farther the estimated elasticity is from -1.0 (more negative), the more price constrained is the firm.

[210] The number of wireless subscribers increased by a factor of six in ten and a half years, growing from 33.8 million in December 1995 to 217.4 in June 2006. See FCC (2007a). Broadband telephone service is still a relatively new technology and is likely in the early stage of diffusion and adoption.

[211] Consumers choosing the provider of their telephone service are making a discrete choice from among several options including technology (wireline, wireless, broadband) and provider of the chosen technology. These choices are not made daily, and a choice may involve an equipment purchase or a contract or that ties the consumer to a provider for some time. Choosing a service provider is a qualitatively different choice than determining how much to use the telephone. Consumers face discrete choices in other contexts including the choice of transportation technology, the choice of fuel source for heating their homes, and the choice of energy supplier. For examples of the use of discrete choice models, see Train (1986 and 2003).

[212] Because the nature of competition is changing, and consumers have alternatives that were not as available or substitutable even a few years ago, historic estimates of demand elasticities are not useful today. For example, Hausman, Tardiff, and Belinfante (1993) estimated the elasticity of demand for access to the telephone network to be -.005, meaning that a 10 percent increase in price would cause just a 0.5% decrease in the number of subscribers. That elasticity was estimated prior to local competition, the growth of wireless, and the availability of broadband. Consumers had but one choice: take the ILEC's service or don't. Now they have a range of options, so elasticities are likely much higher. For the same reason, the results reported in Taylor (1994) are not likely to be valid now. Taylor (2002) lists several problems in estimating the demand for telephone service, and those problems include how to include wireless and broadband.

One interesting approach has been proposed by Weisman:

> Estimates of firm-specific elasticities in local telecommunications markets are not publicly available and the incumbent providers, even if they have such estimates, typically cite proprietary reasons for not disclosing this information. This need not preclude policymakers from using the critical price elasticity approach to inform their deliberations on the issue of deregulation. Policymakers could, for example, request or even require incumbent providers to disclose estimates of firm-specific elasticities and price–cost margins as part of the evidentiary record in deregulation proceedings.[213]

Because of the difficulties involved in conducting econometric studies, states could pool data and resources to develop multi-state or national analyses, the results of which can be particularized in individual state assessments.[214] Multi-state efforts could be done by a NARUC/NRRI working group that would develop a common set of tools, analytical templates, and possibly conduct one or more demonstration analyses.[215] Other approaches include workshops or collaborative efforts through which states could share ideas and determine best practices. Some states have considerable expertise and resources and their insights could aid other states; a workshop or collaborative process would allow them to do so.

F. Planning for ongoing market monitoring

Local telephone markets are evolving technologically and competitively. The stated goal of the Telecommunications Act of 1996 was vigorous competition from multiple independent providers. The FCC has noted:

> The structural and behavioral characteristics of a competitive market are desirable not as ends in themselves, but rather as a means of bringing tangible benefits to consumers such as lower prices, higher quality and greater choice of services. Such consumer outcomes are the ultimate test of effective competition. [216]

The growth of alternative platforms such as wireless and broadband telephone service provides the hope that such vigorous competition will result. There is a strong chance that the existence

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[213] Weisman (2006), 110.

[214] Particularization would use state- or market-specific data in a common general model to develop estimates of substitutability and competitiveness to be applied in individual analyses.

[215] Prior to passage of the 1996 Act, NARUC's Staff Subcommittee on Communications created a work group to consider issues that would arise as a result of the introduction of local competition. See NARUC (1996). NARUC task forces have considered issues such as BPL. See NARUC (2006). These efforts could serve as models for a major effort to consider wireless and broadband competition.

[216] FCC (2006), ¶ 149.

of multiple platforms will bring about vigorous competition and multiple independent sources of supply from which consumers can choose. It is also possible that some markets will evolve into tight oligopolies controlled by a few firms. Competitive analyses are not "one and done" tasks. Regulators should ensure that markets are neither subject to abuse of market power nor overly regulated. Regulators have an ongoing interest in competitive conditions; thus, it would be useful to develop a plan for monitoring local telephone markets and for regularized data gathering and analysis. Market monitoring is thus an important function for state commissions in telecommunications and other markets for which competition is authorized, and still developing.[217]

[217] See Burns, et al. (2000), especially 7-14.

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