Monopoly.com

Will the WorldCom-MCI Merger Tangle the Web?

by Jeff Keefe

Economic Policy Institute

1660 L Street, NW, Suite 1200, Washington, D.C. 20036

ISBN: 0-944826-77-6

JEFF KEEFE is an associate professor and director of the Doctoral Program at the School of Management and Labor Relations, Rutgers University. He is co-author of *Turbulence in the American Workplace,* and is currently working on a study funded by the Alfred P. Sloan Foundation analyzing the restructuring of the telecommunications industry. He received his Ph.D. in industrial and labor relations from Cornell University.

ACKNOWLEDGMENTS. Alice Stelmach and Maya Kromova provided helpful research assistance in the preparation of this report.

ECONOMIC POLICY INSTITUTE
1660 L Street, NW, Suite 1200
Washington, D.C. 20036

http://www.epinet.org

ISBN: 0-944826-77-6

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The proposed merger of WorldCom and MCI has raised questions about whether the consolidated company would dominate the Internet and undermine its democratic, vibrant, and competitive culture.

Using publicly available data, this report makes a *prima facie* case that the merger will severely threaten competition in the Internet market. Reliable estimates show that Internet connections through WorldCom-MCI will account for 62% of Internet revenue, and that over half of Internet service providers will have an Internet backbone connection through the merged company.

Reliable estimates show that Internet connections through WorldCom-MCI will account for 62% of Internet revenue.

These independent market share estimates indicate that a WorldCom-MCI merger will create a highly concentrated Internet backbone market structure. This market dominance will vastly exceed estimates by MCI and WorldCom of a 20% share of the Internet revenue and a 20-22% share of Internet traffic.

A consolidated WorldCom/MCI will own four major Internet backbones, administer five network access points, and be the leading supplier of telecommunications facilities leased by Internet service providers and Internet backbone providers.

Specifically, this study presents the following findings:

- *Market share according to revenue.* Calculations based on a report by the Maloff Group suggest that 62% of Internet revenue generated by Internet providers would be derived from connections through WorldCom/MCI. Overall Internet revenues for a combined WorldCom-MCI are at least $1.5 billion.

- *Market share according to Internet traffic. BoardWatch*, a respected source on the Internet infrastructure, estimates that over half of Internet service providers would receive a backbone connection through a merged WorldCom/MCI.

- *Market share definitive data.* Neither WorldCom nor MCI has provided adequate data on their respective Internet market shares, Internet revenue figures, or their roles in Internet connectivity. In order for the Department of Justice and the Federal Communications Commission to assess accurately antitrust and competitive effects of the proposed merger on the Internet market, they must compel the companies to provide full and detailed information on these market measurements.

INTRODUCTION

On November 10, 1997, WorldCom and MCI announced plans to merge. The $37 billion deal, the largest in U.S. history, immediately raised concerns about how the merger of the two largest Internet backbone providers could effect the vitality of the Internet. In an era of media and telecommunications mergers and conglomerates, the Internet has stood out as a counter-institution. It is a market where small businesses thrive, and it is the locus of modern free speech — any individual can give voice to his or her concerns and be heard. While many political observers have decried the decline of civic association, the Internet has re-energized dialogue among Americans. It has emerged as a place for unfiltered democratic discussion, where ordinary people can communicate unfettered by government or the constant annoyance of the ubiquitous telemarketer or the commercial break.

In an era of media and telecommunications mergers and conglomerates, the Internet is a market where small businesses thrive, and it is the locus of modern free speech.

This paper investigates whether a consolidated WorldCom-MCI could eventually dominate the Internet and potentially undermine the Internet's democratic, vibrant, and competitive culture. The question specifically investigated is whether a merged WorldCom-MCI would be able to dominate either the Internet service provider and/or Internet backbone provider marketplace.

Until now, most observers and Congress have thought the main threat to the Internet came from government regulation. The Telecommunications Act of 1996 states that 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))

But government is not necessarily the main threat. Firms have strong incentives to make competitive markets uncompetitive. Through mergers and acquisitions, firms create monopoly and oligopolistic structures that support the exercise of market power to limit supply and raise prices. This method of pursuing profits can greatly threaten competition and may, ultimately, lead the government to regulate the Internet market on behalf of consumers. Mergers that increase market concentration may increase a firm's ability to engage in unilateral exercise of market power, or they may increase the ability of a group of firms to engage in a coordinated exercise of market power through either overt or tacit collusion. Currently, the Justice Department and the Federal Communications Commission (FCC) are reviewing the proposed acquisition of MCI by WorldCom to examine whether it threatens future competition in the telecommunications and Internet marketplaces.

Opponents of the merger (a group that includes Bell Atlantic, GTE, and the

Communications Workers of America) argue that the new company will be able to exercise market power through its majority ownership (48% to 68%) of the Internet backbone and underlying transmission facilities. The company will control the majority of Internet connections. Focusing on the Internet backbone, opponents claim that the post-merger firm will create a highly concentrated Internet-backbone-provider market structure. The company will own four major Internet backbones: MCI, UUNet, ANS, and Compuserve (the latter three are already owned by WorldCom). It will administer five network access points (NAPs), including the two most heavily trafficked in the world, MAE East and MAE West. WorldCom and MCI will also be the leading supplier of telecommunications facilities leased by Internet service providers and Internet backbone providers. After the merger, all backbones will either be owned by WorldCom-MCI or will operate on facilities leased from WorldCom-MCI (except for a few that will still use Sprint's facilities). This integration of the Internet network represents a "huge barrier of entry for competitors," citing WorldCom Vice Chairman John Sidgmore (Chandrasekran 1997). Consequently, opponents conclude, the merger request should be denied.

Opponents of the merger argue that the new company will be able to exercise market power through its majority ownership of the Internet backbone and underlying transmission facilities.

MCI and WorldCom respond that the new company will not be able to exercise market power, nor will it control any bottleneck facilities that it could use to wield market power. The merged company, they say, will control only 20% of Internet service revenue and traffic. Moreover, WorldCom and MCI vigorously deny that there is a separate Internet backbone market. The Internet, they argue, is a dynamic, rapidly growing marketplace with easy competitive entry. They point out that the number of Internet service providers is steadily increasing, and the number of backbones and network access points have quickly expanded, from a small handful three years ago to more than three dozen today. According to MCI and WorldCom, new entrants that are currently building national fiber optic networks will provide ample competition in the network transmission facilities market. The Internet by its very design is too "flexible and resilient to be dominated by any one entity, and the MCI-WorldCom merger will do nothing to stunt the Internet's growth or inhibit competition" (WorldCom and MCI 1998). Consequently, argue MCI and WorldCom, the merger will not harm competition, and the government should not intervene in the merger but allow the Internet to continue to thrive free of governmental interference.

The entire merger review process may turn on whether the Internet is treated as one service market or is divided into two segments: an Internet service provider market and an Internet backbone provider market, a distinction roughly equivalent to retail and wholesale distribution. Unfortunately, there is insufficient publicly available data to perform the economic tests necessary to rigorously determine

whether there are one or two Internet service markets. A highly secretive commercial culture has grown up around the Internet. Terms of commercial agreements are often undisclosable, making a conclusive economic analysis of the industrial organization of the Internet problematic.

This study does not claim to provide any definitive answers to the question of market domination. It does, however, support GTE's motion (February 25, 1998) seeking disclosure of more information from WorldCom and MCI. The FCC should require WorldCom and MCI to provide sufficient data to address competitive effects of the merger on the Internet market. Neither WorldCom nor MCI has provided adequate data to refute the claim that the Internet backbone provider market is separate from the Internet access market. The companies have also not provided basic information on their Internet revenues, their Internet market share, or their central role in providing Internet connectivity. Nevertheless, a review of the publicly available evidence allows us to focus on the questions raised by the WorldCom-MCI merger case and to establish a *prima facie* case that the merger will severely threaten competition in the Internet market.

A review of the publicly available evidence allows us to establish a prima facie case that the merger will severely threaten competition in the Internet market.

In order to frame the questions about the competitive effect of the WorldCom-MCI merger, the next section of this paper begins with a short review of the Internet's network structure. It discusses some of the difficulties in making a competitive analysis of a network; such an analysis is further complicated by a commercial culture of secrecy and the vertical integration of the key participants in the merger. The subsequent sections examine evidence on the key questions raised by this merger:

- What is the market structure of the Internet?
- What is the appropriate measure of Internet market share and market concentration?
- Does WorldCom and MCI's control over Internet protocol addresses lock in Internet service providers and create the conditions for the exercise of market power?
- Does the ownership of the two largest NAPs — MAE East and MAE West — confer potential market power on an integrated WorldCom-MCI?
- Has there been any overt or tacit collusion between or among WorldCom, MCI, and Sprint in signing interconnection contracts, canceling peering agreements, or inhibiting new peering arrangements?

- Will the merger of WorldCom and MCI create a duopoly (with Sprint) in the provision of Internet backbone service and the underlying network transmission facilities?

The public information currently available to answer many of these questions is not conclusive. However, the Internet is too important to the national information infrastructure to allow the merger to proceed in an information vacuum, especially since the information does exist and can be collected. The nation should not take the chance that one company will dominate the future development of the Internet. Before allowing the merger to proceed, the Justice Department and the FCC will need to decide whether the merger is likely to create or enhance market power or facilitate its exercise. To reach a decision, the agencies must overcome the secretive commercial culture to investigate the Internet's economic structure.[1]

THE INTERNET

Network of Networks – A Brief Review

The Internet is a network of networks that uses a common communications protocol, TCP/IP (transmission control protocol/Internet protocol) to provide a common language for interoperation between computer networks (McKie-Mason and Varian 1997). The technical protocols form the foundation of the Internet: they permit virtually any network to interconnect and to share data with other networks through the Internet. In contrast to telephony, which relies on switched circuits that are set up for the duration of a call, the Internet uses a connectionless adaptive routing system, without dedicated end-to-end channels for each communication. Instead, traffic is split into "packets" that are routed among multiple points, making the Internet an interconnected global network of packet-switched networks using the Internet protocol (Werback 1997).

Prices, settlements, and interconnection agreements are increasingly viewed as proprietary and are contractually restricted from public disclosure.

The Internet functions as a series of layers. It is built on top of telecommunications network facilities and services. The structure of the Internet comprises six basic entities: end users, Internet service providers (ISPs), Internet backbone providers (IBPs), network access points (NAPs), private interconnection agreements, and telephone interexchange carriers (IXCs). End users most often gain access over telephone lines provided by their local exchange carriers either through individual connections with an Internet service provider or through computer networks in organizations such as universities and businesses, which may directly connect to Internet backbone providers using dedicated lines. Internet service providers, such as America Online, Compuserve, and Microsoft Network (MSN), connect end users to the Internet backbone networks. The Internet backbone providers, such as MCI, WorldCom's UUNet, and Sprint, route traffic between ISPs and interconnect with other backbone providers at network access points. The network access points, also called public peering centers, have provided the foundation of the Internet. They are the nodes where the networks interconnect and exchange traffic and routing information. Increasingly, traffic is exchanged at private peering points. Undergirding the Internet backbones and NAPs are the telecommunications facilities, private high-speed lines, and network services leased from major interexchange carriers such as WorldCom, MCI, and Sprint.

A Network of Secret Commercial Agreements

The Internet is also built on layers of commercial agreements. While many Internet end users enjoy the widely available $19.95 flat rate Internet access price, above the ISP retail level prices, settlements, and interconnection agreements are increas-

ingly viewed as proprietary and are contractually restricted from public disclosure (Srinagesh 1997). In 1995, when federal support for the NSFNET backbone ended, the Internet consisted of a number of relatively equal-size commercial backbones that exchanged traffic without fees at network access points; this process is known as "peering." Through competitive contracts, the NSF developed the major regional network access points. Three priority network access points were established in Northern California, Chicago, and New York, and others, such as MAE East and MAE West (created by MFS, now owned by WorldCom), were also created to replace NSFNET and to facilitate the interconnection of commercial backbone providers. Backbone providers may enter interconnection agreements at network access points, but they are not required to enter into any agreement (Bailey 1997).

A hierarchy of commercial contracts has evolved that places the major backbone providers at the center of global interconnectivity.

During 1996, open peering ended as incumbent backbones refused to establish new peering arrangements with newcomers that did not match their size and traffic load (Cook Report 1998). In May 1997, UUNet, in concert with Sprint, announced the end of free peering. New peering arrangements from the major backbone providers are now almost impossible to get; instead, a transit fee is required. Five major backbones, however, still peer with each other and interconnect at most of the major NAPs (Cook Report 1998); however, three of them will become a part of the merged WorldCom-MCI. Internet service providers and dedicated access customers contract with upstream providers for interconnection to the Internet. They pay a monthly fee for their Internet backbone connection, which includes a promise to deliver packets anywhere on the global Internet. If a backbone provider is not a major backbone, such as Sprint, MCI, or UUNet, it will most likely pay a fee to interconnect with the global Internet through a major backbone provider (Cook Report 1998). A hierarchy of commercial contracts has evolved that places the major backbone providers at the center of global interconnectivity. Increasingly the terms of these contracts are proprietary and not subject to public disclosure (Srinagesh 1997). Many Internet backbone providers have entered into long-term agreements to lease their underlying telecommunications network facilities and services from major interexchange carriers; these contracts also are often not subject to public disclosure.

The result is a pyramid of undisclosable commercial contracts. Yet, it is in the process of commercial contracting where potential abuse is most likely to occur, where market power is most likely to be exercised, and where the Internet is most vulnerable to failure. The network interconnection points are the glue of the Internet. If interconnection is prone to market failure, "then the glue may dissolve and the distributed nature of the Internet may yield to monopoly or oligopoly provision and transport" (McKnight and Bailey 1997b). The secrecy surrounding the

Internet's operation and the terms of interconnection stands in sharp contrast to the data and information routinely available about the telephone network. Furthermore, economic analyses of the Internet often lack agreement on terms, definitions, measures, and methodologies. For example, published estimates of 1997 revenue for Internet services vary widely: $4.2 billion (Frost & Sullivan 1996, 3-8), $4.6 billion (International Data Corporation 1997, 15), and $8.4 billion (Maloff Group 1997, 7).

Further complicating the process of analysis is the vertical integration of the major Internet providers. MCI offers dial-up and dedicated Internet access to end users, provides upstream services to ISPs, connects more ISPs to its nationwide backbone than any other Internet backbone provider, and leases its private telecommunications facilities to ISPs and Internet backbone providers. WorldCom is a leader in supplying dedicated Internet access to businesses; it also connects America Online, Compuserve, and MSN to the Internet under long-term exclusive contracts; it already owns three major backbones, UUNet, ANS, and Compuserve, and administers five network access points including two major NAPs, MAE East and MAE West; and it is the leading supplier of telecommunications facilities leased by Internet service providers and Internet backbone providers. This vertical integration potentially can allow a firm to obscure the sources of revenue and profits.

Further complicating the process of analysis is the vertical integration of the major Internet providers.

Internet Network Economics

The economic analysis of competition among Internet service providers and backbone providers is greatly complicated by the presence of network externalities, scale economies, excess capacity or undercapacity, and congestion. Networks exhibit positive consumption and production externalities (Economides 1996). Consumption externalities arise because every communication involves at least two parties, the originator and the receiver. A decision by one person to contact another can generate an uncompensated benefit (or cost) for the contacted party, creating a consumption externality. Production network externalities arise because the private benefit to any one individual of joining a network, as measured by the value he or she places on communicating with others, is less than the social benefits to all other subscribers of communicating with him or her. Again, the subscription decision creates benefits that are not compensated through the market mechanism. Prices chosen by competitive markets are not economically efficient when externalities are present (Gong and Srinagesh 1997). Perfect competition will provide a smaller network than is socially optimal (Economides 1996).

Firms operating in network production processes are often subject to economies of scale. They invest in a costly communications network that represents a

substantial sunk fixed cost embedded in long-lived facilities with excess capacity. Once the network is constructed, the marginal cost of another communication is essentially zero (Gong and Srinagesh 1997). The standard competitive standard that prices be set equal to marginal costs is a recipe for bankruptcy (Baumol and Sidak 1994). At the very bottom of the Internet's hierarchy of networks are the physical resources used to construct the links based on the telephone network. Switches, multiplexors, and fiber optic networks create the point-to-point channels, where scale economies and sunk costs are substantial (Gong and Srinagesh 1997).

A usage-sensitive pricing scheme creates incentives for firms that control bottleneck facilities to engage in anticompetitive behavior by inducing congestion to raise prices and reap the increased earnings.

Large network service providers such as MCI, WorldCom, and Sprint have invested in fiber networks necessary to deliver point-to-point services; each has had substantial excess capacity. Their cost structures include construction costs; fees for rights-of-way; equipment costs for lasers, fiber cable, electronics, switches, and multiplexors; costs for interconnection and negotiation of interconnection agreements; marketing and sales costs; the costs of provisioning, credit checks, and billing; costs of maintaining and monitoring the network to assure service; costs of terminating customers; and general administrative costs. The incremental costs of carrying traffic is zero, as long as there is excess capacity. Marginal cost pricing would result in all facilities-based carriers going out of business (Gong and Srinagesh 1997). The standard competitive model cannot aid us in a network analysis of the Internet.

Furthermore, when excess capacity is depleted, the facilities-based carriers can reap windfall profits. Internet traffic flow is now routed on the first-come, first-served principle. When there is inadequate capacity, any scarcity of Internet bandwidth results in delays due to network congestion. The cost of congestion is measured in delays and lost packets. A frequently proposed alternative to the first-come, first-served principle is peak-load pricing, which seeks to balance traffic volume with capacity by permitting carriers to raise prices to alleviate congestion. This dynamic pricing system, however, creates opportunities for abuse. A usage-sensitive pricing scheme creates incentives for firms that control bottleneck facilities to engage in anticompetitive behavior by inducing congestion to raise prices and reap the increased earnings (Sakar 1997). Any economic analysis of the Internet must also address the incentives and opportunities of firms to capture bottleneck facilities.

MERGERS, MARKETS, AND MARKET POWER: WORLDCOM AND MCI

A merger that increases market concentration can have adverse effects in two ways. First, a merger that increases a firm's market share can increase a firm's ability to engage in the unilateral exercise of market power. Second, a merger that increases market concentration may increase the ability of a group of firms to engage in a coordinated exercise of market through either overt or tacit collusion (Rosenberg 1997).

The assessment of market concentration, potentially adverse competitive effects, market entry, efficiency, and failure are tools used to determine whether a merger is likely to create or enhance market power or to facilitate its exercise. Market concentration is often the starting point. It is a function of the number of firms in a market and their respective market shares. Commonly used measures of market dominance include concentration ratios and the Herfindahl-Hirschman Index (HHI), which is the sum of the squared market shares of all firms in the market. *The Department of Justice and Federal Trade Commission 1992 Merger Guidelines* defines three broad ranges of market concentration as measured by the HHI. These are: unconcentrated — an HHI below 1,000; moderately concentrated — an HHI between 1,000 and 1,800; and highly concentrated — an HHI greater than 1,800. One implication of this classification system is that a market would be classified as highly concentrated if the single largest firm has a market share of 43% or more. Where the post-merger HHI exceeds 1,800, it will be *presumed* that mergers producing an increase in the HHI of more than 100 points are likely to create or enhance market power or facilitate its exercise.

WorldCom and MCI vigorously deny that there is a separate Internet backbone market.

Market shares are calculated using the best indicator of the firms' future competitive significance. Dollar sales are used if firms are distinguished primarily by differentiation of their products. Unit sales are used if firms are distinguished primarily on the basis of their relative advantages in serving different buyers or groups of buyers. Physical capacity or reserves are used if these measures most effectively distinguish firms. Unfortunately, the publicly available data on the Internet yield a wide range of market share estimates, none of which are entirely satisfactory.

There is also substantial disagreement about the market structure of the Internet. WorldCom and MCI vigorously deny that there is a separate Internet backbone market. Most independent observers (*Boardwatch, Cook Report,* Werback) and WorldCom-MCI's critics (GTE, Bell Atlantic, CWA, United States Internet Providers Association) believe there is. The significance of this disagreement is

that, if a separate Internet backbone market exists, then, according to the *Merger Guidelines* on market concentration, the proposed merger will create a company that can be *presumed* to dominate that market. Thus, the outcome of the FCC and Justice Department reviews of the anti-competitive implications of the proposed merger may hinge on determination of whether the Internet backbone provider and Internet service provider markets are distinct.

Estimated Changes in Internet Market Concentration

Most independent observers believe there is a separate and distinguishable Internet backbone provider marketplace.

Numerous estimates have been developed of market share changes that will result from the proposed merger between MCI and WorldCom. Two characteristics of these estimates stand out. First, none of these estimates conforms precisely with any of those requested by the Justice Department to measure market share. Second, the market share estimates vary greatly. On the low side, MCI and WorldCom report market share data indicating that the merged company would hold only a 20% share of Internet market revenue and traffic. Such an unconcentrated marketplace would not require regulatory review. All other estimates of market share are in the 48% to 68% range and indicate that a merger would result in a highly concentrated Internet backbone market (increasing the HHI more than 100 points). See **Table 1** below.

The market differences in part reflect the substantial disagreement about what constitutes an appropriate market and where the market boundaries are. Is there a separate and identifiable Internet backbone provider market? WorldCom and MCI maintain there is no separate backbone market. Instead, they say, they should be judged as Internet service providers. In contrast, most independent observers believe there is a separate and distinguishable Internet backbone provider marketplace.

WorldCom - MCI Internet market share calculations. Arguing that revenues provide the strongest indicator of market share, WorldCom and MCI estimate that their combined Internet market share would be approximately 20%. They obtained this figure by taking the total 1996 Internet industry revenue figure of $2.3 billion from Frost & Sullivan (1997), doubling it to keep in line with analyst growth estimates, and applying their 1997 Internet revenue estimates for MCI and WorldCom to that base figure (WorldCom and MCI 1998). This exercise yields a 1997 Internet revenue figure of $920 million for the combined company. However, this self-reported revenue estimate appears to be too low. Checking publicly available sources (Securities and Exchange Commission filings, *Boardwatch* magazine, and MCI *Internet Vision Statement*), we estimate Internet revenue for a combined WorldCom-MCI to be at least $1.5 billion, which yields a lower-bound market share estimate

TABLE 1
Summary of Estimates of the Merged WorldCom-MCI Internet Market Share

Source	Measure of Market Share	Merged WorldCom-MCI Concentration Ratio
Boardwatch June 1997	WorldCom-MCI backbone connections as percent of total backbone connections with ISPs	55%
Boardwatch ISP Fall Directory, Fall 1997	WorldCom-MCI backbone connections as percent of total backbone connections with ISPs	48%
Boardwatch June 1997 in Comment of Communications Workers of America, January 5, 1998	Percent of ISPs connecting to the WorldCom-MCI backbones	63%
Maloff Group October 1997	Percent of Internet revenue connecting over WorldCom-MCI backbones	68%
Maloff Group October 1997 Revision	Percent of Internet revenue connecting over WorldCom-MCI backbones	62%
Bell Atlantic January 1997	Summary of expert estimates of market share reported in press	60%
Bell Atlantic January 1997	Estimate of share of customer routes using router tables	58%
MCI-WorldCom January 1997	Revenue share estimate	20%
MCI-WorldCom January 1997	Estimate of share of customer routes using router tables	20% or 22%

of 32% (using their methodology of doubling Frost & Sullivan 1996 Internet revenue figure as the base). The reliability of both of these estimates is open to dispute. Since no independent publicly available source reports a combined revenue market share for a merged WorldCom-MCI, there needs to be full disclosure of the Internet revenue data by WorldCom and MCI by market segment.

Bell Atlantic argues that Internet backbone market concentration should be calculated on the basis of ownership of routes on the Internet. On this basis, Bell Atlantic concluded that 58% of routes to customers on the Internet would be owned by the merged company. WorldCom and MCI claim this figure is too high. They

report that their analysis yielded a share of aggregate route entries between 20% and 22% (WorldCom and MCI 1998).

In contrast to the disagreements about market share, this dispute about route entries could be resolved and verified by any party that has access to them. Engineers working on the Internet, not affiliated with any party involved in this merger process, could provide an independent count of the percent of route entries that would be controlled by a merged WorldCom-MCI. They should be asked to do so by the regulatory authorities.

The dispute about route entries could be resolved and verified by any party that has access to them.

Boardwatch Internet market share estimates. *Boardwatch* reports the number of Internet service providers who have connections to each of the major backbones (**Table 2**). The table counts only ISP connections and indicates market share among ISPs only; it does not include commercial, government, university, or nonprofit Internet users who get dedicated access to the Internet. *Boardwatch* claims, however, that it analyzed Internet traffic data patterns, which it states match overall ISP market shares to within hundredths of a percent, with the exception of IBM Global Networks; IBM has some 30,000 business customers and almost no ISPs. *Boardwatch* believes its data represent true relative share sizes.

The June data are from 3,852 ISPs with a total of 4,455 connections. They indicate that each ISP averages 1.16 connections to backbones. The fall *Boardwatch* data show that, while there were some 4,354 Internet service providers, they had 5,739 separate links to backbones. This again makes sense, since some ISPs connect to several backbones. MCI remained the leader with 1,689 connections. This repre-

TABLE 2
Shares of Internet Backbone Connections by Internet Service Provider

	June 1997		Fall 1997	
Backbone Providers	Connections	% of Total Connections	Connections	% of Total Connections
WorldCom-MCI	2,454	55%	2,780	48%
MCI	1,569	35%	1,689	29%
Sprint	1,176	26	1,298	23
UUNET/CIS/ANS	885	20	1,091	19
AGIS	303	7	354	6
BBN	189	4	234	4
Total Connections	4,455		5,739	

Source: *Boardwatch*

sents 29% of the 5,739 connections, while 39% of the Internet service providers connect to MCI. Sprint was second with 1,298 connections, or about 23%. UUNet, with the newly acquired ANS and CompuServe backbones, has a total of 1,091 connections, or 19% of all connections. If WorldCom acquires MCI, it will own 48% of all Internet ISP connections. The data are less clear about what total percentage of ISPs would be connected to a merged WorldCom-MCI, since there is some overlap among ISPs, but it would significantly exceed 50%. In other words, over half of the ISPs would get a backbone connection through a merged WorldCom-MCI.

The June *BoardWatch* data as used by CWA (1998) in its FCC comment probably overstate the effects of the merger, since CWA simply added up ISPs connected to MCI and WorldCom (**Table 3**). The combining of MCI, UUNet, ANS, and CIS ISP connections omits the overlap among the backbones, since some providers have more than one connection. Carlton and Sider (1998) correctly criticize the double counting of ISPs inherent in this approach. However, CWA's approach does indicate how pervasive this proposed combination will be, serving over half of the ISPs in the market. And if *Boardwatch* is correct that its data reflect patterns in the overall Internet market, the combination will serve over half of business customers and others that rely on dedicated access to reach the Internet.

If WorldCom acquires MCI, it will own 48% of all Internet ISP connections.

WorldCom and MCI (1998) and Carlton and Sider (1998) point out that the number of ISP connections has no necessary relationship to the availability of network capacity or the ability of backbone suppliers to expand the provision of services and constrain price. And they are correct when they state that the *Boardwatch*

TABLE 3
Internet Service Provider Connections

	June 1997	
Backbone Providers	Connections	% ISPs Connecting
WorldCom-MCI	2,454	63%
MCI	1,569	41%
Sprint	1,176	31
UUNET/CIS/ANS	885	23
AGIS	303	8
BBN	189	5
Total Connections	4,455	

Source: *Boardwatch*

calculations based on ISP connections alone do not incorporate information on non-ISP customers, such as direct customer connections to backbone providers. Yet, they fail to refute *Boardwatch's* claim that Internet traffic data match overall ISP market shares to within hundredths of a percent. The major advantage of these measures is that *Boardwatch* did the counting and performed the calculations, not MCI, WorldCom, or their critics. Additionally, this estimate of a merged MCI-WorldCom market share of the Internet can be independently verified.

Our own calculations based on the Maloff report data suggest that 62% of the Internet revenue would gain Internet connection through WorldCom-MCI.

The Maloff report of market share estimates. According to the Maloff report (1997), the U.S. Internet access marketplace had revenue of $8.4 billion in value in October 1997. This number is considerably higher than other published market studies. The report was able to identify 5,121 ISP nodes in the U.S. serving 877,650 dial-up ports and 19.2 million dial-up customers. MCI was mentioned most often as the leading backbone providing access to smaller ISPs, followed by Sprint and UUNet. The Maloff Group reports that, during the past year, WorldCom (owner of UUNet, GridNet, and MFS) moved to acquire ANS from AOL, CompuServe's Network Services Division, and MCI. At the same time, UUNet quietly became the underlying carrier for WebTV, Earthlink, and Microsoft Network. AT&T and Sprint largely missed the market.

Using the share of industry revenue generated by Internet service providers that would connect through WorldCom-MCI as the measure of market share, a combination of AOL, ANS, CompuServe, UUNet, and MCI provides WorldCom with 56.7% market share, according to the report. Maloff includes AOL in this number because of its long-term (five-year) arrangement for network services from WorldCom and because AOL's Steve Case holds a seat on the WorldCom board of directors. Microsoft Network and Earthlink are two other large ISPs that obtain their Internet connectivity from UUNet, yielding a 68.3% market share, according to the Maloff report. If we add Concentric, the seventh-largest ISP, which currently obtains its Internet backbone connectivity from both MCI and WorldCom, the MCI-WorldCom combined market share estimate rises to 71.5%, according to the Maloff report.

The Maloff report thus indicates that up to 72% of the Internet revenue generated by Internet providers would connect through WorldCom-MCI. These estimates appear to be on the high side. Our own calculations based on the Maloff report data suggest that 62% of the Internet revenue would gain Internet connection through WorldCom-MCI (**Table 4**). While the lack of accurate publicly available data makes it difficult to have confidence in a precise number, the analysis makes clear that a preponderance of Internet service providers would connect through the merged company.

TABLE 4
IP Revenue Connecting to the Internet Through WorldCom-MCI Backbones ($Millions)

Internet Provider	Revenue	Percent
ANS	$88	1%
Concentric	246	3
UUNET	351	4
MCI	134	2
Earthlink	104	1
America Online	2,160	26
CompuServe	1,406	17
MSN	739	9
Total WorldCom-MCI	$5,228	62%
Total U.S. IP Access	$8,430	

Source: Maloff Report, October 1997.

Bell Atlantic's estimate of the merged WorldCom-MCI market share. Bell Atlantic claims that a merged WorldCom-MCI will control over half the Internet. Bell Atlantic summarizes expert estimates of the post-merger Internet market share reported in the press (see **Table 5**). It concludes that the HHI measure of market concentration reveals an alarming loss of competition in the market. On average, the post-merger HHI is twice that identified in the *Merger Guidelines* as indicating a market that is "very concentrated."

The reported market share estimates range from 49% to 80%. By averaging the reported expert estimates, Bell Atlantic concludes that a post-merger WorldCom-MCI would possess a 60% Internet market share. Replicating these results is complicated by the lack of independently available and verifiable data. But a thorough search of resources available on the Internet echoes the estimates reported by Bell Atlantic.

Summary. MCI and WorldCom present data suggesting that the post-merger firm, earning 20% of the Internet's revenue and carrying 20-22% of the Internet's traffic, would operate in an unconcentrated Internet marketplace. In contrast, critics and independent observers present a series of estimates suggesting that the post-merger firm, controlling 48-68% of Internet traffic and revenue, would create a highly concentrated Internet market structure. If these estimates accurately reflect the current Internet economic structure, then it must be presumed under the Justice Department's *Merger Guidelines* that the merger will create or enhance market

TABLE 5
Bell Atlantic Estimates of Market Concentration
In the Internet Backbone Following a WorldCom/MCI Merger

Source of Estimate	Post-Merger Market Share	Minimum HHI
Boardwatch Survey Jon Healey, "MCI Bid Puts Net at Stake," *San Jose Mercury News* (10/2/97)	51%	2,601
Information Week Mary Thyfault & Beth Davis, "Users Assess WorldCom's $30 Billion Bid for MCI," *Information Week* (10/6/97)	49%	2,401
Industry experts George Mannes, "Wall St. WorldCom Beater, Internet Worries Linked to Prices," *New York Daily News* (10/3/97)	"up to" 80%	6,400
Decision Resources Inc. "WorldCom Tops Its $20 Billion, 20 Month Spending Spree With a $30 Billion Bid for MCI," *PR Newswire* (10/3/97)	"at least" 60%	3,600
Inter@ctive Week Wilson & Barrett, "Proposed Colossus Craves International Reach," *Inter@ctive Week* (10/6/97)	"more than" 50%	2,500
Wall Street Journal Thomas E. Weber and Rebecca Wuick, "Would WorldCom-MCI Deal Lift Tolls on Net?" *Wall Street Journal* (10/2/97)	"more than" 60%	3,600
Arlen Communications "Rival's Bid for MCI Nearly $30 Billion," *Sacramento Bee* (10/2/97)	"over" 70%	4,900
Mean	**60%**	**3,600** **(3,715)***

*Mean of calculated HHIs, as opposed to HHI calculated from mean of market share estimates.

power and enhance its exercise. Thus, government involvement is called for.

The Justice Department and the FCC should require WorldCom and MCI to fully disclose their Internet revenues, their interconnection backbone agreements, their peering agreements, their contracts with Internet service providers, their contracts with dedicated access customers, their administrative procedures and agreements at their network access points, and their private line, facility, and service agreements to provide telecommunications services to Internet service providers

and Internet backbone providers. In addition, the FCC and the Justice Department should call upon the Internet engineering community to resolve disputes over traffic flow, traffic volume, ISP connections, and overall traffic patterns and to determine the proportion the merged company would control.

Does the Merger Create Bottlenecks, Lock-Ins, and Tacit Collusion?

The economic analysis of networks focuses attention on problems arising from interconnection agreements. Through a pyramid of commercial contracts, the major backbone providers are placed at the center of global interconnectivity. The terms of these contracts are proprietary and not subject to public disclosure. Yet, it is in the process of commercial contracting where potential abuse is most likely to occur, where market power is most likely to be exercised, and where the Internet is most vulnerable to failure. "It is the network interconnection points that are both the glue of the Internet and mostly likely to yield to monopoly or oligopoly provision and transport" (McKnight and Bailey 1997b). Particularly, the control over bottleneck facilities creates conditions where a firm can engage in anticompetitive behavior (Sakar 1997).

It is in the process of commercial contracting where the Internet is most vulnerable to failure.

Bell Atlantic and others argue that the merger of MCI and WorldCom will create and exacerbate bottleneck control and lock-in costs that will enable the exercise of market power and tacit collusion. The opponents say that three conditions would allow a merged WorldCom-MCI to exercise market power that will result in higher prices for Internet service. First, ISPs face technical obstacles in switching Internet backbone providers, since there is no general portability of IP address space. Second, of the major network access points at which backbone providers connect their networks, WorldCom owns five, including the two dominant NAPs, MAE East and MAE West. These unregulated bottleneck points could give WorldCom crucial leverage over other Internet backbone providers. Third, the behavior of UUNet and Sprint in May 1997, when they announced the cancellation of numerous peering agreements with ISPs, plus the current limitations placed on new entrants in negotiating peering agreements, can be interpreted as anticompetitive and tacitly collusive behavior. Alleged tacit collusion has been occurring in the pricing of publicly switched long-distance service among AT&T, MCI, and Sprint (MacAvoy 1996); that alleged behavior could be easily replicated in the pricing of Internet backbone services by WorldCom-MCI and Sprint. In addition, ISPs may have little incentive in terms of price or quality to switch backbones once WorldCom and MCI merge, since most Internet traffic will travel across segments of WorldCom. The combined company could thus control the terms and conditions by which everyone's traffic is transported across the Internet, either through access or interconnection.

Each of these allegations, along with the responses by WorldCom, MCI, and their experts, will be summarily presented below and critically evaluated.

Internet protocol addresses and ISP lock-in costs. Bell Atlantic (1998) argues that the lack of portability of Internet protocol (IP) address space provides substantial lock-in costs to ISPs that may face price increases or quality degradation by a merged WorldCom-MCI. This position is reinforced by the United States Internet Providers Association (1998). Over 90% of ISPs currently obtain IP address space by leasing address space directly from their upstream provider (Bell Atlantic 1998). IP block allocations are strictly controlled by the American Registry for Internet Numbers (ARIN). The ISPs who lease rather than own address space face almost insurmountable obstacles to switching backbones. To switch, they must be assigned new IP addresses and engage in the burdensome and time-consuming task of renumbering their networks and systems and the networks and systems of all their customers. Renumbering creates substantial dangers of disruption and customer losses, and creates customer service problems and expense (USIPA 1998). Forced renumbering can be used as a means to lock in clients to a particular backbone provider. MCI and WorldCom, as the largest Internet backbone provider, will own substantial IP block allocations, giving them considerable market power in pricing Internet backbone services.

The ISPs who lease rather than own address space face almost insurmountable obstacles to switching backbones.

WorldCom and MCI dismiss both Bell Atlantic's claims that this problem affects 90% of ISPs and USIPA's assertion that the "vast majority" of all ISPs borrow their IP addresses from their backbone provider. Since WorldCom and MCI do not recognize a distinction between Internet backbone providers and Internet service providers, they treat retail ISPs who contract for upstream services and Internet backbone provision as dedicated access customers. They do, however, recognize that changing ISPs may be somewhat more involved for smaller dedicated access customers that are provided with IP addresses by their ISP. But according to MCI and WorldCom, many of these customers are now using the dynamic host configuration protocol (DHCP) and other means that eliminate the need to configure IP addresses in individual computers. Consequently, the potential for lock-in due to high switching costs, they say, affects only a small subgroup of dedicated access customers that may not yet have adopted, but could readily adopt, measures that would facilitate changing IP addresses. WorldCom and MCI claim that customers who are directly connected to an ISP and do not have portable IP addresses have tools available to facilitate IP address changes. The ability to lock in customers because of the costs associated with changing IP addresses is a non-issue, according to WorldCom and MCI (1998).

This dispute might be easily resolved by investigating whether most ISPs use dynamic host configuration protocol and, if not, how costly it would be for them to install it or a similar product. Again, this issue could be resolved with the assistance of engineers who are expert in IP address configuration and the associated costs in changing IP addresses. It cannot, however, simply be ignored or dismissed.

Does WorldCom's ownership of five NAPs create market leverage? Bell Atlantic (1998) argues that because WorldCom owns five NAPs, including the two dominant NAPs, MAE East and MAE West, these bottleneck points will give WorldCom-MCI leverage over other Internet backbone providers. Bell Atlantic reports that WorldCom's MAE East in Washington, D.C. handles more than 60% of all worldwide traffic, an estimated 85% of all intra-European traffic, and roughly 40% of U.S. Internet traffic. As owner of five NAPs, WorldCom has the ability to influence the terms by which traffic is shared, not only between its network and other networks, but among other networks as well. A backbone provider or ISP cut off from a WorldCom NAP could find itself in dire straits, since other NAPs are overwhelmed with traffic and congestion. Ownership of these facilities gives WorldCom enormous influence in the marketplace, according to Bell Atlantic. No other backbone has this sort of control; only one other backbone, Sprint, is in direct control of even a single NAP (the New York NAP located in New Jersey, which handles less traffic than either MAE East or MAE West). These unregulated bottleneck points, according to Bell Atlantic, give WorldCom leverage over other Internet backbone providers.[2]

As owner of five NAPs, WorldCom has the ability to influence the terms by which traffic is shared, not only between its network and other networks, but among other networks as well.

WorldCom and MCI (1998) respond that the merger will have no effect on network access points. First, they say, MCI owns no NAPs. Second, no NAP is a bottleneck, since low barriers to entry have led to a steady increase in the number of NAPs, from four in the U.S. in 1994 to 39 today. Thus, ISPs have a wide variety of NAPs to which they can link, and any attempt by WorldCom pre-merger, or MCI-WorldCom post-merger, to take advantage of ISPs connected to any WorldCom NAP would not confer any competitive advantage. In light of the ease with which an ISP can route around a NAP, the ease with which new NAPs can be and have been created, and the lack of any connection between the merger and consolidation of ownership or operation of NAPs, WorldCom and MCI argue that Bell Atlantic's NAP-related contentions do not warrant any further investigation or action.

It is clear from our research, however, that not all NAPs are created equal. As NAPs have become increasingly congested, the major backbones now peer with one another at private exchange points, avoiding the NAP congestion. At the major NAPs, such as MAE East and MAE West, the large Internet backbone providers interconnect with smaller backbone providers and some ISPs. The presence of the

major backbone providers in one location may confer a market advantage on the owner of the NAP. In addition, if the NAP owner is also a major backbone provider that relies on private exchange agreements to carry the bulk of its traffic, it may not have a strong incentive to upgrade the NAP to alleviate congestion.

Regulators need to address a number of questions before reaching a conclusion on the issue of market leverage at NAPs and private exchange points. Does a single peering location occur because of network efficiency considerations, and, if so, do these efficiency considerations provide the NAP owner with any pricing power? Or, since there is a relative proliferation of NAPs, is there relatively costless movement without any offsetting efficiency losses? Is the size of a NAP a source of market power arising from increased interconnection options, or are there disadvantages due to increased congestion? As NAPs become congested and major backbone providers move to private interconnection locations that ensure higher-quality connectivity for themselves, does this necessarily mean lower-quality connections for their smaller competitors? Is there a conflict of interest in serving as a NAP owner and a major backbone provider? Again, many of these questions could be answered by engineers within the industry.

Some observers also detected collusion between WorldCom, Sprint, and others in announcing the end of free peering.

Is there any evidence of anticompetitive or collusive behavior? Last spring UUNet, a WorldCom subsidiary, instituted a new "peering" policy that canceled free interconnection for smaller Internet backbones. In May 1997, according to Bell Atlantic, WorldCom began charging smaller ISPs and backbone networks not only for Internet transit, but simply for access to its customer routes. Backbones and ISPs that refused to pay the fees for customer routes were told that they would not be able to reach WorldCom's customers. Perhaps as many as 30 small backbones and ISPs were notified that WorldCom intended to discontinue peering at various dates in late May and early June. Additionally, in order to negotiate a new agreement, they needed to sign a five-year non-disclosure agreement just to be quoted a price from UUNet (Rickard 1997). UUNet was the subject of widespread condemnation by the communications and Internet press and the Internet community, and by the end of the year relatively few ISPs had been de-peered. In many cases UUNet backed off because of the bad publicity (Cook Report 1998); in other cases, the ISPs eventually capitulated because they had no choice. MCI, BBN, and Sprint then began charging smaller backbones too (Bell Atlantic 1998).

Some observers also detected collusion between WorldCom, Sprint, and others in announcing the end of free peering (Rickard 1997; Cook Report 1998). Rickard stated:

> "while it appears to be UUNET, we have already amassed sufficient evidence of collusion from PSI and SPRINT to probably send someone to jail, but in any event sufficient to pull together a really interesting class action lawsuit that could potentially cripple all three companies. (Rickard 1997)

There is no evidence, however, that a class action lawsuit was ever filed.

WorldCom's logic for its new peering policy was based on the recognition that its backbone network had grown bigger than most others. If the merger is approved, WorldCom will have no equals. If WorldCom enforces its current interconnection standards after the merger, even Sprint can expect WorldCom to stop freely peering with its networks. And at that point, customers would have little incentive to switch to a competing backbone provider, since all prices ultimately will be regulated by WorldCom through the prices it charges for peering.

There is a need to determine whether WorldCom and MCI's control over IP addresses locks ISPs into depending on their upstream service.

WorldCom and MCI respond that peering should be viewed as involving payment in kind — a barter arrangement — that makes sense when the peers exchange roughly comparable amounts of traffic. Otherwise, an access fee should be paid from the smaller to larger provider, when the smaller provider wants to utilize the larger provider's network or to reach a greater number of customers. The companies argue that any attempt to impose unreasonable conditions on interconnection would simply cause the affected provider to utilize alternative means to reach MCI and WorldCom's customers, which would only increase the revenues of MCI and WorldCom's competitors.

Undoubtedly, speaking from recent experience, WorldCom and MCI find it hard to imagine a more certain way to destroy a company's reputation than to make it difficult for other ISPs and their customers to exchange traffic with MCI and WorldCom and its customers, or to refuse to interconnect on reasonable terms. In retrospect it appears that the attempt to do so was simply ill-advised. The company's reputation was greatly damaged as web pages, bulletin boards, and chat rooms mobilized the Internet community to oppose the heavy hand of UUNet. Sprint's involvement in the cancellations (Rickard 1997) along with allegations about the five large peering backbones (Cook Report 1998) raise questions about tacit collusion among the large Internet backbone providers. Allegations about tacit collusion could be ignored in this merger review were it not for the substantial evidence of tacit collusion in the pricing of publicly switched long-distance service among AT&T, MCI, and Sprint (MacAvoy 1996). That practice could be easily replicated in the pricing of Internet backbone service by WorldCom-MCI and Sprint.

Summary and conclusions. There is a need to determine whether WorldCom and MCI's control over IP addresses locks ISPs into depending on their upstream ser-

vice. This can be accomplished by investigating whether most ISPs use dynamic host configuration. Other questions that need to be investigated include whether the presence of all major backbone providers confers any market advantage for a NAP; whether a single peering location occurring because of network efficiency considerations provides the NAP owner with any pricing power; or whether the size of a NAP is a source of competitive advantage or disadvantage due to increased congestion. Finally, the evidence on whether there has been tacit and overt collusion between WorldCom, MCI, and Sprint in signing interconnection agreements, canceling peering, or inhibiting peering needs to be considered and confirmed or refuted during the review process.

With the rapid growth in Internet products, customers, and traffic there has to be sufficient bandwidth availability to provide wholesale services and backbone connectivity.

The Merger and Internet Growth and Ease of Entry

WorldCom and MCI argue that the merger will do nothing to slow the dynamic growth of the Internet or diminish the vigorous competition among Internet service providers. There can be no doubt concerning the Internet's rapid growth and the ease of entry. In less than two years, from February 1996 to October 1997, the number of Internet service providers grew from 1,447 to 4,354. In the last three years the number of network access points grew from four to 39, and the number of Internet backbone providers increased from a small handful to three dozen. Internet revenue has grown from an estimated $1.85 billion in annualized revenue as of April 1996 to $8.4 billion as of October 1997 (Maloff Report 1997; cited by Carlton and Sider 1998). With the development of the World Wide Web, the demand for Internet connections exploded. Local telephone companies were taken by surprise as record numbers of consumers demanded second lines to connect to their Internet service provider. New Internet products are now being readied for deployment, including Internet fax, Internet voice mail, Internet telephony, and Internet interactive video. There are predictions that the packet-switched Internet will eventually replace the circuit-switched public telephone network. WorldCom and MCI assure us that the merger cannot harm competition in the provision of Internet services.

Even some experts who express concerns about the anticompetitive motives behind the MCI-Worldcom merger remain confident that the decentralized, highly competitive Internet environment is sufficiently robust to undermine any efforts of the merged company to exercise market power (Maloff 1997; Rickard 1998). However, with the rapid growth in Internet products, customers, and traffic there has to be sufficient bandwidth availability to provide wholesale services and backbone connectivity. Otherwise, the Internet will experience congestion, which creates the opportunity for mischief and market failure.

MCI and WorldCom assure us that there are no significant barriers to capac-

ity expansion by either incumbent network providers or new firms building networks. They report that new national, high-capacity fiber optic networks are currently being deployed, and new entrants have recently announced plans for more network deployments. They predict that within two years there will be seven national fiber optic networks with abundant capacity to support Internet growth and development. Only four, however, currently exist, and that number will become three if the merger is approved — AT&T, MCI-WorldCom, and Sprint. Two more are currently under construction by Qwest and IXC, and two have been announced by Level 3 and Williams.[3] Other announcements have since followed by GTE and Frontier. The merger, however, will eliminate the nation's fourth-largest fiber optic network, WorldCom, and merge it into MCI's, which is the nation's second largest network.

WorldCom is currently the leading supplier of telecommunication network facilities for lease to Internet backbone providers.

MCI and WorldCom believe that the only possible source of a competitive issue presented by the merger arises from the transmission facilities providing Internet service (1998).[4] After the merger, with the exception of Sprint's facilities, essentially all backbones will either be owned by WorldCom-MCI or will operate on facilities leased from WorldCom-MCI (Rickard 1998). WorldCom is currently the leading supplier of telecommunication network facilities for lease to Internet backbone providers. By allowing it to merge with MCI, one of two other Internet national network suppliers, Sprint will become the only national network alternative to WorldCom-MCI. The other likely candidate, AT&T, has not participated in the Internet wholesale market. When it launched AT&T World Partners, for example, it relied on BBN to provide its backbone services; AT&T has participated only at the retail level of the Internet market.

To alleviate any concern about a merged WorldCom-MCI's control over transmission facilities, WorldCom, MCI, and their experts, Carlton and Sider, focus on the expansion plans of the other potential network providers. The current telecommunications interexchange market is highly concentrated. The top four companies owned 97% of the total communications plant at the end of 1996 (**Table 6**). WorldCom is the only national network provider operating outside the framework of the big three, AT&T, MCI, and Sprint. Since WorldCom is not a brand-name long-distance provider, it leases most of it facilities, and much of those leased facilities carry Internet traffic. The new competitors will also lease their facilities. WorldCom and MCI are convinced the new entrants will supply them with effective competition. However, competitors such as IXC and Qwest accounted for only 3% of the total communications plant and less than 5% of the total fiber route miles in 1996. IXC owned less than one-half of 1% of the total interexchange carrier plant in 1996.

The removal of the independent WorldCom may represent the most serious

TABLE 6
Total Communication Plant Owned
By Interexchange Carriers Reporting to FCC at End of 1996

	Total Communications Plant ($Billion)	Proportion of Plant Owned by Interexchange Carrier
AT&T	$32.94	58.94%
MCI	14.62	26.16
Sprint	4.11	7.35
WorldCom	2.39	4.28
Frontier	0.44	0.79
IXC	0.27	0.48
All Others	1.12	2.00
Total	$55.89	

Source: *FCC, Statistics of Communications Common Carriers 1997, Table 2-1*

threat to the competitive provision of telecommunications bandwidth and capacity to the Internet. WorldCom owns the fourth-largest fiber optic network, which was at the end of 1996 larger than all other smaller networks combined. Without vigorous competition from AT&T, GTE, and the regional Bells, the merger may create the conditions that foster tacit or overt collusion between WorldCom and Sprint in providing Internet backbone services and transmission facilities under long-term contracts.

The Internet service market is characterized by change, rapid growth, and ease of entry. However, some core antitrust questions arise at undergirding network levels of the Internet marketplace. Does it make any sense to allow two of only four integrated interexchange carriers to merge, particularly when the four account for 97% of the telecommunications network facilities? Does it make any sense to allow a merger between two of the three largest providers of Internet transmission facilities? Will the merger of WorldCom and MCI create a duopoly in the provision of national network services? Will the merger create conditions that allow the new company to dominate the Internet and exercise market power individually or in concert with Sprint? Or will the new entrants that are currently deploying national fiber optic networks provide ample competition to keep competitive pressure on the two major providers? The answers to these questions and the federal and state government responses may determine the future vitality of the Internet.

KEY QUESTIONS REGARDING INTERNET MARKET DOMINATION

What is the market structure of the Internet?

WorldCom and MCI vigorously deny that there is a separate Internet backbone market.[5] Most independent observers and WorldCom-MCI critics believe there is a separate Internet backbone provider market and that the merger may create a company that will dominate that market. The determination of the Internet's market structure may ultimately determine the outcome of the review process.

What is the appropriate measure of Internet market share and market concentration?

Every independent market share estimate indicates that a WorldCom-MCI merger will create a highly concentrated Internet backbone market structure and is likely to create or enhance market power or facilitate its exercise. Further analysis is warranted. The Justice Department and the FCC need to force WorldCom and MCI to fully disclose their Internet revenues, their interconnection backbone agreements, their peering agreements, their contracts with Internet service providers, their contracts with dedicated access customers, their administrative procedures and agreements at their network access points, and their private line, facility, and service agreements to provide telecommunications services to Internet service providers and backbone providers. In addition, the FCC and the Justice Department should call upon the Internet engineering community to resolve disputes over traffic flow, traffic volume, ISP connections, and overall traffic patterns and the proportion the merged company would control.

The Justice Department and the FCC need to force WorldCom and MCI to fully disclose their Internet revenues and their interconnection backbone agreements.

Does WorldCom and MCI's control over IP addresses lock in ISPs and create the conditions for the exercise of market power?

This question can be answered by investigating whether most ISPs and dedicated access customers use dynamic host configuration protocol and, if not, how costly it would be for them to install it or a similar product. Again, this issue could be resolved with the assistance of engineers who are expert in IP address configuration and the associated costs in changing IP addresses.

Does the ownership of the two largest NAPs confer any market power on WorldCom-MCI?

Furthermore, does a single peering location occur because of network efficiency considerations, and, if so, do these efficiency considerations provide the NAP with

any pricing power? Or, since there is a relative proliferation of NAPs, is there relatively costless movement without any offsetting efficiency losses? Is the size of a NAP a source of market power arising from increased interconnection options, or are there disadvantages due to increased congestion? Again, these questions could be answered by engineers within the industry. Additionally, how different are the transit contracts negotiated at the respective NAPs? Are they basically standard agreements or do they vary depending on the size and quality of the NAP? Since this information is not publicly available, hearings and investigations must force its disclosure.

Does it make sense to allow two of only four integrated interexchange carriers to merge, particularly when the four account for 97% of the telecommunications network facilities?

Has there been any overt or tacit collusion between WorldCom, MCI, and Sprint in signing interconnection agreements, canceling peering, or inhibiting peering?
Those who believe there is tacit collusion among Internet backbone providers, particularly WorldCom, MCI, and Sprint, should introduce their evidence into the FCC review process.

Will the merger of WorldCom and MCI create a duopoly in the provision of national network services to Internet?
The core antitrust questions arise at the network levels of the Internet marketplace. Does it make sense to allow two of only four integrated interexchange carriers to merge, particularly when the four account for 97% of the telecommunications network facilities? Does it make sense to allow a merger between two of the three largest providers of Internet transmission facilities? Will the merger create conditions that allow the new company to dominate the Internet and exercise market power individually or in concert with Sprint? Or will the new entrants that are currently deploying national fiber optic networks provide ample competition to keep competitive pressure on the two major providers?

CONCLUSION

The Internet is too important to our national information infrastructure to chance that any one company will dominate its future development. Before allowing the merger to proceed, the Justice Department and the FCC must decide whether the merger is likely to create or enhance market power or facilitate its exercise. To make that decision, they must advance our knowledge of the economic structure of the Internet. The secretive commercial culture of the Internet is ripe for the exercise of market power and prevents any public scrutiny of commercial practices. Only the government's subpoena power can apparently break through the culture of secrecy surrounding the Internet's economic structure.

Only the government's subpoena power can apparently break through the culture of secrecy surrounding the Internet's economic structure.

This study reviews the publicly available evidence and uses it to focus the questions concerning the issues in the merger case. Although these questions cannot be answered with precision, there is a prima facie case that the merger will severely threaten competition in the Internet market. GTE's motion of February 5, 1998 deserves support. The FCC should require WorldCom and MCI to provide sufficient data to address competitive effects of the merger on the Internet market. Neither WorldCom nor MCI have provided sufficient data to demonstrate that the Internet backbone market should not be examined separately from the Internet access market. GTE rightly requests that WorldCom and MCI provide traffic data for their networks; revenue data from the various parts of the Internet market in which they participate; a list of the major competitors in the Internet backbone market and their relative market shares; any internal analyses differentiating between Internet backbone and Internet access providers; customer counts; and business plans with regard to network upgrades and expansion, NAP upgrades and expansion, and peering, access, and interconnection agreements. After an appropriate period for public review of the new material, the FCC should structure a new pleading cycle to ensure informed public comment.

ENDNOTES

1. At present, the Hart-Scott-Rodino documents obtained by the Justice Department's antitrust review provide the only window into the culture of secrecy surrounding the Internet's economic structure.

2. Increasingly traffic is exchanged by the large backbone providers at private peering points. This may also have implications for market leverage

3. There are also some issues concerning the independence of the new competition from WorldCom and MCI. According to Carlton and Sider (1998), WorldCom and MCI both plan to lease capacity from IXC. Also, two current members of WorldCom's board, Richard Jaros and David McCourt, are employed by Peter Kiewit Sons, which owns Level 3 Communications. According to Joseph Nacchio, president and CEO of Qwest Communications International in Denver, "Level 3's network is still just a concept" (January 18, 1998). Williams, another new competitor, developed the Williel network, which is also now owned by WorldCom.

4. We, however, believe this is a secondary issue. The primary concern about the merger arises from the interconnection agreements.

5. WorldCom and MCI argue that they are just Internet service providers, two among thousands of peers. Interestingly, WorldCom's subsidiary UUNet led the charge last summer to end peering on the Internet.

BIBLIOGRAPHY

Bailey, Joseph P. 1997. "The Economics of Internet Interconnection Agreements." In Lee McKnight and Joseph Bailey, eds., *Internet Economics*. Cambridge, Mass.: MIT Press.

Barr, William P., et al. 1998. *In the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for CC Docket No. 27-211 Transfer of Control of MCI Communications Corporation to WorldCom, Inc.* Petition to Deny of GTE Service Corporation and Its Affiliated Telecommunications Companies. Washington, D.C.: FCC. (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/)

Baumol, William J., and J. Gregory Sidak. 1994. *Toward Competition in Local Telephony*. Cambridge, Mass.: MIT Press; Washington, D.C.: American Enterprise Institute.

Bell Atlantic. *Before the Federal Communications Commission in the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for CC Docket No. 27-211 Transfer of Control of MCI Communications Corporation to WorldCom, Inc. Petition to Deny the Application of WorldCom or, in the Alternative, to Impose Conditions*. Washington, D.C.: FCC. (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/, January 5, 1998.)

BoardWatch. http://www.boardwatch.com/isp/fall97/

Carlton, Dennis W., and Hal S. Sider. 1998. Declaration of Dennis W. Carlton and Hal S. Sider. *In the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for CC Docket No. 27-211 Transfer of Control of MCI Communications Corporation to WorldCom, Inc. Comments of the Communications Workers of America* Washington, D.C.: FCC. (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/)

Chandrasekaran, R. 1997. "Making UUNet Into a Very Big Deal." *Washington Post*, September 29 (quoting John Sidgmore).

Cook Report. www.cookreport.com

Economides, Nicholas. 1996. "The Economics of Networks." *International Journal of Industrial Organization*, Vol. 14, No. 2.

Frost & Sullivan. 1996. *U.S. Internet Service Markets*. Mountainview, Calif.: Frost & Sullivan.

Goldman, Debbie, and George Kohl. 1998. *Before the Federal Communications Commission. In the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for CC Docket No. 27-211 Transfer of Control of MCI Communications Corporation to WorldCom, Inc. Comments of the Communications Workers of America.* Washington, D.C.: FCC. (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/, January 26).

Gong, Jiong, and Padmanabhan Srinagesh. 1997. "The Economics of Layered Networks." In Lee McKnight and Joseph Bailey, eds., *Internet Economics*. Cambridge, Mass.: MIT Press.

International Data Corporation. 1997. *The Internet Service Provider Marketplace, 1996-2000: A Dual Telecommunications Opportunity*. International Data Corporation.

MacAvoy, Paul. 1996. *The Failure of Antitrust and Regulation to Establish Competition in Long-Distance Telephone Service*. Cambridge, Mass.: MIT Press; Washington, D.C.: American Enterprise Institute.

Maloff, Joel, and Smith, Rick R., eds. 1997. "1996-1997 Internet Access Providers Marketplace Analysis." *Maloff Report*.

McKie-Mason, Jeffrey, and Hal Varian. 1997. "Economic FAQs About the Internet." In Lee McKnight and Joseph Bailey, eds., *Internet Economics*. Cambridge, Mass.: MIT Press.

McKnight, Lee, and Joseph Bailey. 1997a. "An Introduction to Internet Economics." *Internet Economics*. Cambridge, Mass.: MIT Press.

McKnight, Lee W., and Joseph Bailey. 1997b. "Internet Economics: When Constituencies Collide in Cyberspace." *IEEE Internet Computing<http://computer.org/internet/>* November-December, pp. 31-37.

MCI. 1997. *MCI's Internet Policy Vision: A Global View of the Worldwide Network of Networks*. Washington D.C.: MCI. (http://www.mci.com/aboutus/company/news/internetpolicy/index.shtml)

Rickard, Jack. 1997. "Introduction." *Fall 1997 Directory of Internet Service Providers. Boardwatch* magazine.

Rickard, Jack. 1997. "The Big, the Confused, and the Nasty: UUNET Resigns From the Internet." *Boardwatch*, Vol. 11, No. 6.

Rickard, Jack. 1998. "A Cache and Carry Internet." *Boardwatch*, Vol. 11, No. 2.

Rosenberg, Edwin A. 1997. *Telecommunications Mergers and Acquisitions: Key Policy Issues and Option for State Regulations.* Columbus, Ohio: National Regulatory Research Institute.

Sakar, Mitrabarun. 1997. "Internet Pricing: A Regulatory Imperative." In Lee McKnight and Joseph Bailey, eds., *Internet Economics*. Cambridge Mass.: MIT Press.

Srinagesh, Padmanabhan. 1997. "Internet Cost Structures and Interconnection Agreements." In Lee McKnight and Joseph Bailey, eds., *Internet Economics*. Cambridge, Mass.: MIT Press.

U.S. Department of Justice. 1992. *U. S. Department of Justice and Federal Trade Commission Merger Guidelines.* Washington, D.C.: U.S. Department of Justice; Federal Trade Commission.

United States Internet Providers Association. *Response of the United States Internet Providers Association. In the Matter of Applications of WorldCom, Inc. and MCI Communications Corp. for Transfer of Control of MCI Communications Corp. GTE Service Corporation Motion to Dismiss Applications of WorldCom, Inc. and MCI Communications Corp. for Transfer of Control of MCI Communications Corp.* Withdrawn, Washington D.C.: FCC. *CC Docket No. 97-211* (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/, January 26, 1998).

Werback, Kevin. 1997. "Digital Tornado: The Internet and Telecommunications Policy." Washington, D.C.: Federal Communications Commission, Office of Policy and Plans, Working Paper Series 29.

WorldCom and MCI. 1998. *Joint Reply of WorldCom, Inc. and MCI Communications Corporations to Petitions to Deny and Comments. In the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for CC Docket No. 97-211.*

Transfer of Control of MCI Communications Corporation to WorldCom, Inc. Washington, D.C.: FCC (http://www.fcc.gov/Bureaus/Common Carrier/Comments/worldcom/, January 26).

RECENT EPI BOOKS

The State of Working America 1996-97
by Lawrence Mishel, Jared Bernstein, & John Schmitt
0-7656-0024-2 (paper) $24.95
0-7656-0221-0 (cloth) $55.00

Getting Prices Right
The Debate Over the Consumer Price Index
edited by Dean Baker
0-7656-0222-9 (paper) $19.95
0-7656-0221-0 (cloth) $50.95

Risky Business
Private Management of Public Schools
by Craig E. Richards, Rima Shore, &Max B. Sawicky
0-944826-68-7 (paper) $19.95

Reclaiming Prosperity: A Blueprint for Progressive Economic Reform
edited by Todd Schafer & Jeff Faux
Preface by Lester Thurow
1-56324-769-0 (paper) $19.95
1-56324-768-2 (cloth) $62.50

The Macroeconomics of Saving, Finance, and Investment
edited by Robert Pollin
0-472-10787-9 (cloth) $52.00

School Choice
Examining the Evidence
edited by Edith Rasell & Richard Rothstein
0-944826-57-1 (paper) $17.95

U.S. Trade Policy and Global Growth
New Directions in the International Economy
edited by Robert A. Blecker
1-56324-531-1 (paper) $22.95
1-56324-530-2 (cloth) $52.50

Beware the U.S. Model
Jobs & Wages in a Deregulated Economy
edited by Lawrence Mishel & John Schmitt
0-944826-58-X (paper) $24.95

The New American Workplace: Transforming Work Systems in the United States
by Eileen Appelbaum & Rosemary Batt
0-87332-828-0 (paper) $18.95
0-87332-827-2 (cloth) $45.00

Unions and Economic Competitiveness
edited by Lawrence Mishel & Paula B. Voos
0-87332-828-0 (paper) $20.95
0-87332-827-2 (cloth) $46.95

HOW TO ORDER

All orders for EPI books, studies, working papers, and briefing papers should be addressed to:

EPI Publications
1660 L Street, NW, Suite 1200, Washington, D.C. 20036

or call: **800-EPI-4844** (202-331-5510 in Washington area)

Orders can be faxed to: **(202) 775-0819.**

EPI will send a complete catalog of all publications. Discounts are available to libraries and bookstores and for quantity sales.

EPI's website contains executive summaries and introductions to recent EPI books and studies. Publications can be ordered from the website as well. The address is:

http://www.epinet.org

RECENT EPI STUDIES

LIVING STANDARDS & LABOR MARKETS

NONSTANDARD WORK, SUBSTANDARD JOBS
Flexible Work Arrangements in the U.S.
by Arne L. Kalleberg et al.
94 pages, $12, 1997

MANAGING WORK AND FAMILY
Nonstandard Work Arrangements Among Managers and Professionals
by Roberta M. Spalter-Roth et al.
70 pages, $12, 1997

THE PROSPERITY GAP
A Chartbook of American Living Standards
by Edith Rasell, Barry Bluestone, & Lawrence Mishel
110 pages, $15, 1997

WHERE'S THE PAYOFF? The Gap Between Black Academic Progress and Economic Gains
by Jared Bernstein
55 pages, $12, 1995

COST AND QUALITY MATTERS: Workplace Innovations in the Health Care Industry
by Ann Greiner
86 pages, $12, 1995

RAISING THE FLOOR: The Effects of the Minimum Wage on Low-Wage Workers
by William E. Spriggs & Bruce W. Klien
92 pages, $12, 1994

THE SKY HASN'T FALLEN
An Evaluation of the Minimum Wage Increase
by Jared Bernstein & John Schmitt
16 pages, $5, 1997

CUTTING WAGES BY CUTTING WELFARE
The Impact of Reform on the Low-Wage Labor Market
by Lawrence Mishel & John Schmitt
10 pages, $5, 1995

LOW-WAGE LABOR MARKET INDICATORS BY CITY AND STATE
The Constraints Facing Welfare Reform
by Jared Bernstein
100 pages, $10, 1997

FAMILY FRIEND OR FOE? Working Time, Flexibility, and the Fair Labor Standards Act
by Lonnie Golden
24 pages, $5, 1997

GOVERNMENT & THE ECONOMY

BAD DEAL OF THE CENTURY
The Worrisome Implications of the WorldCom-MCI Merger
by Dan Schiller
28 pages, $12, 1998

WHERE'S THE MONEY GONE?
Changes in the Level and Composition of Education Spending, 1967-91
by Richard Rothstein with Karen Hawley Miles
98 pages, $12, 1995

WHERE'S THE MONEY GOING?
Changes in the Level and Composition of Education Spending, 1991-96
by Richard Rothstein
28 pages, $12, 1997

THE PUBLIC INVESTMENT DEFICIT: Two Decades of Neglect Threaten 21st Century Economy
by Dean Baker
22 pages, $5, 1998

GROWING STATE ECONOMIES
How Taxes and Public Services Affect Private-Sector Performance
by Timothy J. Bartik
70 pages, $12, 1996

The Privatization of Public Service
Lessons From Case Studies
by Elliott Sclar
28 pages, $12, 1997

Paying the Toll: Economic Deregulation of the Trucking Industry
by Michael H. Belzer
84 pages, $12, 1994

Do State & Local Tax Incentives Work?
by Robert G. Lynch
34 pages, $12, 1996

Robbing the Cradle? A Critical Assessment of Generational Accounting
by Dean Baker
51 pages, $12, 1995

TRADE & COMPETITIVENESS

Trading Away Good Jobs
An Examination of Employment and Wages in the U.S., 1979-94
by Robert E. Scott, Thea Lee, & John Schmitt
13 pages, $5, 1997

American Jobs and the Asian Crisis
The Employment Impact of the Coming Rise in the U.S. Trade Deficit
by Robert E. Scott & Jesse Rothstein
13 pages, $5, 1998

Jobs on the Wing: Trading Away the Future of the U.S. Aerospace Industry
by Randy Barber & Robert E. Scott
96 pages, $12, 1995

New Priorities in Financing Latin American Development: Balancing Worker Rights, Democracy, and Financial Reform
by Jerome Levinson
64 pages, $12, 1994

Japanese Auto Transplants and the U.S. Automobile Industry
by Candace Howes
102 pages, $12, 1993

POLITICS & PUBLIC OPINION

Volatile Voters: Declining Living Standards and Non-College-Educated Whites
by Ruy A. Teixeira & Joel Rogers
46 pages, $10, 1996

The Politics of the High-Wage Path
The Challenge Facing Democrats
by Ruy A. Teixeira
25 pages, $10, 1994

Who Joined the Democrats?
Understanding the 1996 Election Results
by Ruy A. Teixeira
7 pages, $5, 1996

SUSTAINABLE ECONOMICS

Clearing the Air
The Impact of Air Quality Regulations on Jobs
by Eli Berman & Linda T.M. Bui
36 pages, $12, 1997

Falling Prices: Cost of Complying With Environmental Regulations Almost Always Less Than Advertised
by Hart Hodges
15 pages, $5, 1997

A New Look at Environmental Regulation and Competitiveness
by Eban Goodstein
21 pages, $5, 1997

Jobs and the Environment
The Myth of a National Trade-Off
by Eban Goodstein
44 pages, $12, 1995

ABOUT EPI

The Economic Policy Institute was founded in 1986 to widen the debate about policies to achieve healthy economic growth, prosperity, and opportunity in the difficult new era America has entered.

Today, America's economy is threatened by slow growth and increasing inequality. Expanding global competition, changes in the nature of work, and rapid technological advances are altering economic reality. Yet many of our policies, attitudes, and institutions are based on assumptions that no longer reflect real world conditions.

Central to the Economic Policy Institute's search for solutions is the exploration of policies that encourage every segment of the American economy (business, labor, government, universities, voluntary organizations, etc.) to work cooperatively to raise productivity and living standards for all Americans. Such an undertaking involves a challenge to conventional views of market behavior and a revival of a cooperative relationship between the public and private sectors.

With the support of leaders from labor, business, and the foundation world, the Institute has sponsored research and public discussion of a wide variety of topics: trade and fiscal policies; trends in wages, incomes, and prices; the causes of the productivity slowdown; labor-market problems; rural and urban policies; inflation; state-level economic development strategies; comparative international economic performance; and studies of the overall health of the U.S. manufacturing sector and of specific key industries.

The Institute works with a growing network of innovative economists and other social science researchers in universities and research centers all over the country who are willing to go beyond the conventional wisdom in considering strategies for public policy.

Founding scholars of the Institute include Jeff Faux, EPI president; Lester Thurow, Sloan School of Management, MIT; Ray Marshall, former U.S. secretary of labor, professor at the LBJ School of Public Affairs, University of Texas; Barry Bluestone, University of Massachusetts-Boston; Robert Reich, former U.S. secretary of labor; and Robert Kuttner, author, editor of *The American Prospect,* and columnist for *Business Week* and the Washington Post Writers Group.

For additional information about the Institute, contact EPI at 1660 L Street, NW, Suite 1200, Washington, DC 20036, (202) 775-8810.